SOIL REMEDIATION REPORT

FOR

501 ELLIS STREET

MOUNTAIN VIEW, CALIFORNIA

Conducted November 6 to December 31, 1991

VOLUME I—TEXT

Submitted in Fulfillment of
the Requirements of U.S. EPA
CERCLA §106 Order, Docket No. 91-4

Prepared for

NEC Electronics Inc.

By

Bechtel Environmental, Inc.

San Francisco, California

March 1992

58 pages total

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This document was prepared in compliance with
Section IX.A.10 of the Administrative Order for Remedial
Design and Remedial Action, EPA Docket No. 91-4.

Janet L. Argyle
Bechtel Environmental, Inc.

NEC Electronics Inc.

Table of Contents

LIST OF TABLES

TABLE NO.

LIST OF FIGURES

FIGURE NO.

Appendices (Volume II)

Executive Summary

PURPOSE

The purpose of this report is to document the soil remediation activities performed at the former manufacturing facility of NEC Electronics, Inc. (NEC), located at 501 Ellis Street, Mountain View, CA ("the site"). The remediation activities began on November 6, 1991 and concluded on December 31, 1991.

The soil remediation was completed at the site to fulfill the requirements of Sections IX.D.2.d and IX.D.2.f of the *CERCLA § 106 Administrative Order for Remedial Design and Remedial Action in the Matter of the Middlefield-Ellis-Whisman (MEW) Study Area, U.S. EPA Docket No. 91-4, dated November 29, 1990 ("Administrative Order").*

The purpose of the soil remediation was to satisfy the cleanup standard established by EPA in the *Record of Decision (ROD)*, dated May 1989 and in the *Explanation of Significant Differences (ESD)*, dated September 1990. The Administrative Order, ROD, and ESD are collectively referred to as the "§106 Order" or the "Order" hereinafter.

BACKGROUND

The property at 501 Ellis Street was leased by NEC from 1978 through the end of 1991. It consists of a relatively flat tract of land, mostly paved open area, and approximately two acres in size. A large one-story building occupies the western portion of the property. Prior to 1984, NEC used the facility for manufacturing of semiconductors. The manufacturing operation ceased in 1984, and underground units (a tank, a buried sump and a buried burmar line) were removed. The building was vacated later.

Several investigation programs were conducted at the site, starting in 1982 and continuing through 1991. The latest soil investigation, referred to as the Phase IV soil investigation, was performed in 1991. The results of the Phase IV soil investigation, along with the summary of previous investigations were reported to EPA in the following document:

> *Phase IV Soil Investigation, 501 Ellis Street Property, NEC Electronics Inc., Mountain View, California, prepared by Bechtel Environmental, Inc., July 1991* (BEI, July 1991).

Previous investigations indicated the presence of volatile organic compounds (VOCs) at the site. As described in the Order, EPA selected trichloroethylene (TCE) as the "indicator parameter" for the site remediation within the MEW Study area. EPA established a cleanup standard of 0.50 mg/kg (ppm) for TCE concentrations within the "unsaturated soil stratum" which lies between the ground surface and the top of the shallow aquifer. The approximate depth to the top of the shallow aquifer is 16 feet at the site. Two soil remediation alternatives were selected by EPA for the MEW Study Area as described in the ROD: 1) Soil excavation and aeration, or 2) In-situ soil vapor extraction. NEC proposed the first alternative for remediation of the NEC 501 site.

The results of the Phase IV soil investigation indicated two areas at the site where TCE concentrations exceeded the established cleanup standard. Both of these areas were located east of the building in the paved open area. The two areas of concern (Areas 1 and 2) were discussed in a final remedial design document (RDD) which NEC submitted to EPA on September 6, 1991; the document was entitled:

> ***Proposed Final Remedial Design and Construction Operation and Maintenance Plan For 501 Ellis Street, Mountain View, California, Volumes I&II For NEC Electronics Inc., By Bechtel Environmental, Inc. September 1991*** (BEI, September 1991) .

The RDD presented NEC's proposal to perform a final soil exploration program to further define the extent of contaminated areas and to implement soil remediation at the site as required by the Order. After EPA verbally approved the RDD on October 9, 1991 (written approval on October 31, 1991), NEC proceeded with the soil exploration and remediation at the site and completed the work in December 1991 ahead of EPA schedule.

SCOPE

During the soil remediation activities, 36 exploratory soil borings were drilled and sampled to delineate the lateral extent of the areas where previous data indicated TCE concentrations above 0.5 mg/kg (ppm) within the unsaturated soils. The exploration was limited to the unsaturated soil stratum, extending down to a depth of about 16 feet below grade.

Based on the results of the exploration, approximately 210 cubic yards of soils were excavated within the paved area east of the building (Areas 1 and 2). The excavation consisted of 37 vertical auger shafts, each with a diameter of about 3.5 feet and approximate depth of 16 feet.

The excavated material was aerated on site, and cleanup was verified by field and laboratory analyses. The excavated auger-holes were backfilled with imported fill, lean grout, or the aerated clean soils as confirmed by laboratory analyses.

After decontamination, the remediation equipment was demobilized. The excess aerated soil and all of the construction debris from the site activities were transported to the City of Mountain View Landfill. Wash water from the decontamination activities was discharged at an on-site sewer inlet, in accordance with an amendment to the existing discharge permit from the City of Mountain View. The asphalt pavement in the parking lot was restored and the site remediation was concluded on December 31, 1991.

CONCLUSIONS

Soil remediation at the site was completed in December 1991 in accordance with the RDD. It consisted of excavation and aeration of approximately 210 cubic yards of soil from the unsaturated zone, extending from the ground surface to a depth of about 16 feet below grade. Twenty-seven exploratory borings were made outside the 501 building to determine the extent of excavation. Soil remediation was not extended beneath the building, considering the levels of TCE detected in the soil samples obtained from the nine indoor exploratory borings. The soil remediation was conducted to meet the EPA established cleanup standard of 0.5 mg/kg for TCE in the soil.

Section 1

Introduction

This document has been prepared to fulfill the requirements of Sections IX.D.2.d and IX.D.2.f of the *CERCLA § 106 Administrative Order for Remedial Design and Remedial Action in the Matter of the Middlefield-Ellis-Whisman (MEW) Study Area, U.S. EPA Docket No. 91-4, dated November 29, 1990 ("Administrative Order").* The entire report addresses the progress reporting requirement in Section IX.D.2.d. Subsection 3.6.4.1 of this report is intended to meet the confirmatory sampling requirements in Section IX.D.2.f of the Order.

The Administrative Order applies to nine respondents one of whom is NEC Electronics Inc. EPA placed some of the MEW sites on the National Priority List ("NPL") on June 1, 1986, and October 4, 1989. The MEW Study Area includes three NPL sites and several non-NPL sites. One of these non-NPL sites is NEC's former manufacturing facility located at 501 Ellis Street, which is defined in this report as the "site" or the "NEC 501 site."

This report documents the soil remediation activities performed in late 1991 at the NEC 501 site only. The soil remediation procedures were presented in a final remedial design document which NEC submitted to EPA on September 6, 1991; the document was entitled:

> *Proposed Final Remedial Design and Construction Operation and Maintenance Plan For 501 Ellis Street, Mountain View, California, Volumes I & II For NEC Electronics Inc., By Bechtel Environmental, Inc. September 1991* (BEI, September 1991).

The Proposed Final Remedial Design (PFRD), Volume I, and the Construction Operation and Maintenance Plan (COMP), Volume II, are together designated in this report as the "remedial design document", or "RDD."

This Introduction provides a site description, background information, a definition of treatment and clean-up standard, a discussion of site characterization and a description of the overall project.

1.1 Site Description

The site is located at 501 Ellis Street, Mountain View, California. The property is situated on a relatively flat tract of land that slopes gently to the north towards San Francisco Bay (Figure 1). The Bay is approximately two miles to the north, and the Santa Cruz Mountains are approximately six miles to the south. The property is approximately two acres in size, consisting mainly of a paved open area. A large single-story building occupies the western portion of the property. The properties surrounding the site are occupied primarily by other electronics industries.

Figure 2 shows the five main buildings comprising the NEC Electronics (NEC) complex in Mountain View, California. Figure 3 presents the layout of the 501 Ellis Street facility defined in this report as the "site."

1.2 Background

The property at 501 Ellis Street was leased in 1978 by NEC and used for semiconductor manufacturing operation until 1984. The major manufacturing activity at the site was wafer fabrication which included thermal oxidation, photolithography, doping, chemical vapor deposition, and metalization processes.

Burmar waste, which consisted of phenolics, sulphonic acid, chlorobenzenes, and mixed aromatic solvents, was transferred from the process building to an above-ground storage tank via an underground pipeline. Spent hydrofluoric acid and ammonium fluoride were also sent to an above-ground storage tank via an underground pipeline. Waste solvents were stored in an underground storage tank. Acidic wastewater was neutralized in a subsurface sump before being discharged to the municipal sewer system.

Prior to 1984, NEC maintained and operated the buried waste solvent tank, the acid neutralization sump and the buried waste lines (Burmar and hydrofluoric acid lines), as described above. The buried waste lines transported liquid wastes from the building to the vaulted above ground tanks at the eastern edge of the property. In May of 1983, a break was discovered in the Burmar line where the line entered the building. The line was repaired immediately.

The manufacturing operation ceased, and the underground units (the buried tank, the subsurface acid neutralization sump, and the underground Burmar pipes) were removed in 1984. The approximate locations of the removed underground units are shown in Figure 3. At the time of excavation, a 10-inch crack was observed in the sump which could have allowed sump water to leak. Along with the underground units, approximately 86 cubic yards of the surrounding contaminated soils were removed. The open excavation, which was about 9 feet deep, was backfilled. Soil investigations were conducted before and after the backfill operation as discussed below.

Between 1982 and 1991, several site investigation programs were conducted at the NEC site. The earlier investigations were initiated by NEC in 1982 in response to the Regional Water Quality Control Board's (RWQCB) investigation of facilities with underground chemical tanks in their production process. The latest investigation (Phase IV Investigation) was performed in response to the "Administrative Order" issued by U.S. EPA Region IX. These investigations consisted of soil gas surveys, soil exploration, and monitoring well installations. The results of these investigations were summarized in the latest investigation report submitted to EPA:

> ***Phase IV Soil Investigation, 501 Ellis Street Property, NEC Electronics Inc., Mountain View, California, prepared by Bechtel Environmental, Inc., July 1991*** (BEI, July 1991).

Based on the results of the Phase IV Investigation, NEC submitted the proposed final remedial design document (RDD) to EPA on September 6, 1991. The presentation in the RDD included the following:

- Summary of previous site investigations,
- Proposed locations of required additional exploratory soil borings,
- Description of the activities and procedures necessary to achieve the required cleanup standard within the unsaturated soil stratum (Zone 1),
- Specifications and detailed plans necessary to implement the design,
- Field Sampling Plan (FSP),
- Quality Assurance Project Plan (QAPP), and
- A Safety, Health and Emergency Response Plan (SHERP).

The RDD was verbally approved by EPA on October 9, 1991 (written approval on October 31, 1991).

1.3 Treatment and Cleanup Standard

Soil treatment technologies for the MEW Study Areas are described in the *Record of Decision (ROD),* issued by EPA Region IX in May of 1989. The ROD specified treatment for the unsaturated soils in "Zone 1" which is defined as the shallow subsurface soil stratum starting at the ground surface and extending down to the top of the ground water (top of the shallow aquifer). The bottom of Zone 1 at the NEC 501 site is approximately 16 feet below grade. Two treatment alternatives were discussed in the ROD, and approved by EPA for the MEW site: 1) removal and aeration of the contaminated soils in the subsurface Zone 1, or 2) in-situ vapor extraction. The first alternative was used for the soil remediation at the NEC 501 site.

EPA established a cleanup standard of 0.5 mg/kg (ppm) for TCE levels in the soil as specified in the ***Explanation of Significant Differences (ESD),*** issued by EPA in September of 1990. The Administrative Order, the ROD, and the ESD, are collectively referred to as the "CERCLA §106 Order", or the "Order" in this report.

In accordance with the Order, the RDD defined "contaminated soils" as those soils with TCE concentrations above 0.5 mg/kg based on laboratory analyses; soils with TCE concentrations at or below 0.5 mg/kg were defined as "clean soils". The same definition is used in this report unless explicitly indicated otherwise.

1.4 Site Characterization

As a result of previous investigations at the MEW Study Area, EPA identified 15 chemicals of concern as listed in the Order and presented below:

<u>Organics</u>

Chloroform	Phenol
1,2-Dichlorobenzene	Tetrachloroethene
1,1-Dichloroethane	1,1,1-Trichloroethane

Organics (cont'd)

1,1-Dichloroethene	Trichloroethene ("TCE")
1,2-Dichloroethene	Vinyl Chloride
Freon 113	

Inorganics

Antimony
Cadmium
Arsenic
Lead

EPA selected Trichloroethene (TCE) as the "indicator parameter" for the soil cleanup at the MEW Study Area. The Administrative Order states that the soil cleanup for TCE is expected to remove the other volatile organic chemicals of concern listed above. Thus, soils containing volatile organics at the NEC 501 site were to be treated to the cleanup standard established for TCE.

The results of the Phase IV soil investigation had indicated two areas at the site where TCE concentrations exceeded the established cleanup standard. As shown in Figure 4, one of these areas (Area 1) was located immediately east of the building in the paved area close to the former locations of the underground tank and sump removed in 1984. The second area (Area 2) was also located in the paved area farther east of the building and close to the former location of the vaulted tank at the southeastern edge of the property. The two areas of concern (Areas 1 and 2) were discussed in more detail in the RDD.

During the Phase IV investigation, only six out of 676 soil samples from the unsaturated zone showed TCE concentrations exceeding the established cleanup standard (0.5 mg/kg). All six samples were collected from Area 1 and Area 2 as summarized in Table 1. Five of these six samples were collected from three borings (boring numbers 6, 56 and 104) within Area 1, as shown in Figure 5. The soil samples contained TCE ranging from 0.53 to 1.6 mg/kg, and they were collected from depths of 8 to 12 feet below grade. The sixth sample was collected from SB-25 in Area 2, as shown in Figure 6. This sample contained 1.7 mg/kg of TCE at 10 to

11 feet below grade. Based on these results, Area 1 and Area 2 were each designated in the RDD as a "potentially contaminated area" or "PCA".

The four borings listed above indicated three hot spots within Area 1 and one hot spot within Area 2. A "hot spot" was defined in the RDD as a relatively smaller localized area within each PCA where soil analyses on any sample collected from any boring indicated TCE levels exceeding the cleanup standard.

As proposed in the RDD, additional (final) exploratory borings were required within each PCA (Area 1 and Area 2) in order to delineate the extent of the hot spots and determine the boundaries of the required remediation. Based on statistical analysis, the RDD proposed a triangular grid pattern of 5.6 feet between the proposed final exploratory borings. Based on such a grid pattern, thirty exploratory borings (Figures 5 and 6) were proposed in the RDD to complete the site characterization.

1.5 Project Description

1.5.1 Purpose and Objectives

The project consisted of implementing the soil exploration and soil remediation activities at the NEC 501 site as proposed in the RDD. After EPA's approval of the RDD, NEC performed the proposed remedial work and accomplished the following main objectives:

- The extent of the hot spots outside the 501 building was delineated within two potentially contaminated areas (Areas 1 & 2) by performing a final soil exploration program.
- The contaminated soils within the hot spots were removed and remediated by excavation and aeration.

The remediation project was initiated on November 6, 1991 and was completed on December 31, 1991. No manufacturing activities were in progress at the time of remediation and the 501 building had been vacated prior to the remediation activities.

The purpose of soil remediation completed at the site was to satisfy the cleanup standard established by EPA and to fulfill the requirements of Sections IX.D.2.d and IX.D.2.f of the Administrative Order. This report documents the soil remediation activities performed at the NEC 501 site in late 1991.

1.5.2 Scope of Final Exploration

Thirty-six exploratory soil borings were drilled to delineate the lateral extent of the hot spots within two areas at the site (Areas 1 and Area 2). The hot spots, as defined in Section 1.4, are localized areas where TCE concentrations in the soil samples exceeded the established cleanup standard. The boring and sampling strategy was as outlined in the RDD. The final exploratory soil borings were designated R-1 through R-36.

The exploration was limited to the unsaturated zone, extending from the ground surface down to a depth of about 16 feet below grade. The surveyed locations of the exploratory borings are presented in Figures 7 and 8 for Areas 1 and 2, respectively. Based on the results of the exploration, the lateral extent of the hot spots was identified and the boundaries of the required soil excavation areas were delineated. Soil remediation was then initiated.

1.5.3 Scope of Soil Remediation

Approximately 210 cubic yards of soil were excavated outside the 501 building within Areas 1 and 2. The excavation consisted of 37 vertical auger shafts, each with a diameter of about 3.5 feet and approximate depth of 16 feet. These shafts were augered with a bucket-auger attached to a hydraulic motor on the boom of a truck-mounted excavator. These vertical shafts were designated as auger-holes 1 through 37. The auger-holes were overlapped such that each excavation area obtained complete coverage over the delineated excavation boundaries.

The excavated material was either verified clean or aerated on site until it was clean. Cleanup was verified by field and laboratory analyses. The excavated auger-holes were immediately backfilled with imported fill, lean grout, or the aerated clean soils, depending on the availability of material or the location of the excavation. Lean grout was used adjacent to the building foundations.

After decontamination, the remediation equipment was demobilized. The excess aerated clean soils and all the construction debris from the site activities were disposed of at the City of Mountain View Landfill. The asphalt pavement in the parking lot was restored. Water from the decontamination activities was discharged at an on-site sewer inlet in accordance with the amendment to the existing discharge permit from the City of Mountain View. The site remediation was concluded on December 31, 1991. The fence surrounding the site was removed on January 3, 1992.

1.5.4 Project Organization

The remediation project team was organized as proposed in the RDD and briefly described in this Subsection. The organization and key personnel of the project team are shown on the Organization Chart presented in this Subsection. The key project team members were representatives of the following companies:

- NEC Electronics Inc. (NEC)
- Thelen, Marrin, Johnson & Bridges (TMJ&B), legal counsel to NEC
- Bechtel Environmental, Inc. (BEI).

1.5.4.1 Key NEC and TMJ&B Personnel

The NEC Coordinator is the NEC representative responsible for directing all the environmental work performed for NEC at the site. The NEC Coordinator also served as the liaison between the project team, NEC management, and any NEC entities or departments needed to facilitate the performance of the site work. The NEC coordinator's responsibilities included:

- Approving contracts and reimbursement of major contractors;
- Approving waste disposal for any wastes accumulated during the project;
- Signing hazardous waste manifests; and
- Approving any changes to the scope and budget of the project.

The Project Coordinator is a representative from Thelen, Marrin, Johnson & Bridges. The Project Coordinator provided overview of NEC remedial activities with major responsibilities including the following:

- Serving as the liaison between NEC, BEI, EPA, and other interested parties;
- Issuing NEC project correspondence;

- Authorizing BEI technical consulting activities; and
- Providing legal counsel to NEC.

1.5.4.2 Key Bechtel Personnel

The Project Manager is BEI's management representative for this project with the authority and responsibility for the overall project management, execution of the contract, and coordination with NEC. The Project Manager receives functional and staffing support from the BEI Environmental Technologies Manager and the Geotechnical Group Coordinator. Major responsibilities included the following:

- Establishing lines of communication, working relationships, interfaces, controls, and reporting requirements both within BEI and within the contractors' network;
- Providing clearly defined project scope and objectives for the remediation team and establishing schedules, budgets, and manpower requirements;
- Controlling project scope, cost, schedule, and quality of work ;
- Procuring and managing subcontractors required for implementation of the work;
- Securing the services of qualified personnel to perform the required work and securing management reviews in accordance with BEI policy;
- Approving contract deliverable items including reports, contracts, and correspondence with NEC;
- Establishing, as required, a project Risk Management Plan and providing necessary controls for implementations of the required procedures for occupational safety and health;
- Establishing and implementing project procedures and controls for the Quality Assurance Program; and
- Directing proper maintenance of project records.

To perform the field remediation activities, BEI provided a Project Engineer responsible for the technical effort required for the execution of the work on site, including the overall scientific and engineering activities of the project. Major responsibilities included:

- Ensuring that technical activities were performed in accordance with the Quality Assurance Project Plan (QAPP), Health and Safety Plan, and other applicable procedures;
- Directing the execution of exploration work, sampling , and remedial actions as applicable;
- Directing and coordinating the technical activities of the project team and obtaining assistance from BEI technical specialists , as needed;
- Securing independent technical reviews of work prior to issuance of data or reports; and
- Providing a report of the remedial work upon completion and transmission of all the field and laboratory data per approved QAPP.

In addition, a Quality Assurance Supervisor was assigned to the project who was responsible for ensuring that all work was conducted in compliance with the Quality Assurance Project Plan (QAPP). A Site Safety and Health Officer was present at the site during the entire remediation work. He interfaced with the Project Manager on a regular basis and reported to the BEI Safety and Health Officer. He was responsible for verifying and documenting that all work performed at the site was in compliance with the Site Health and Emergency Response Plan (SHERP).

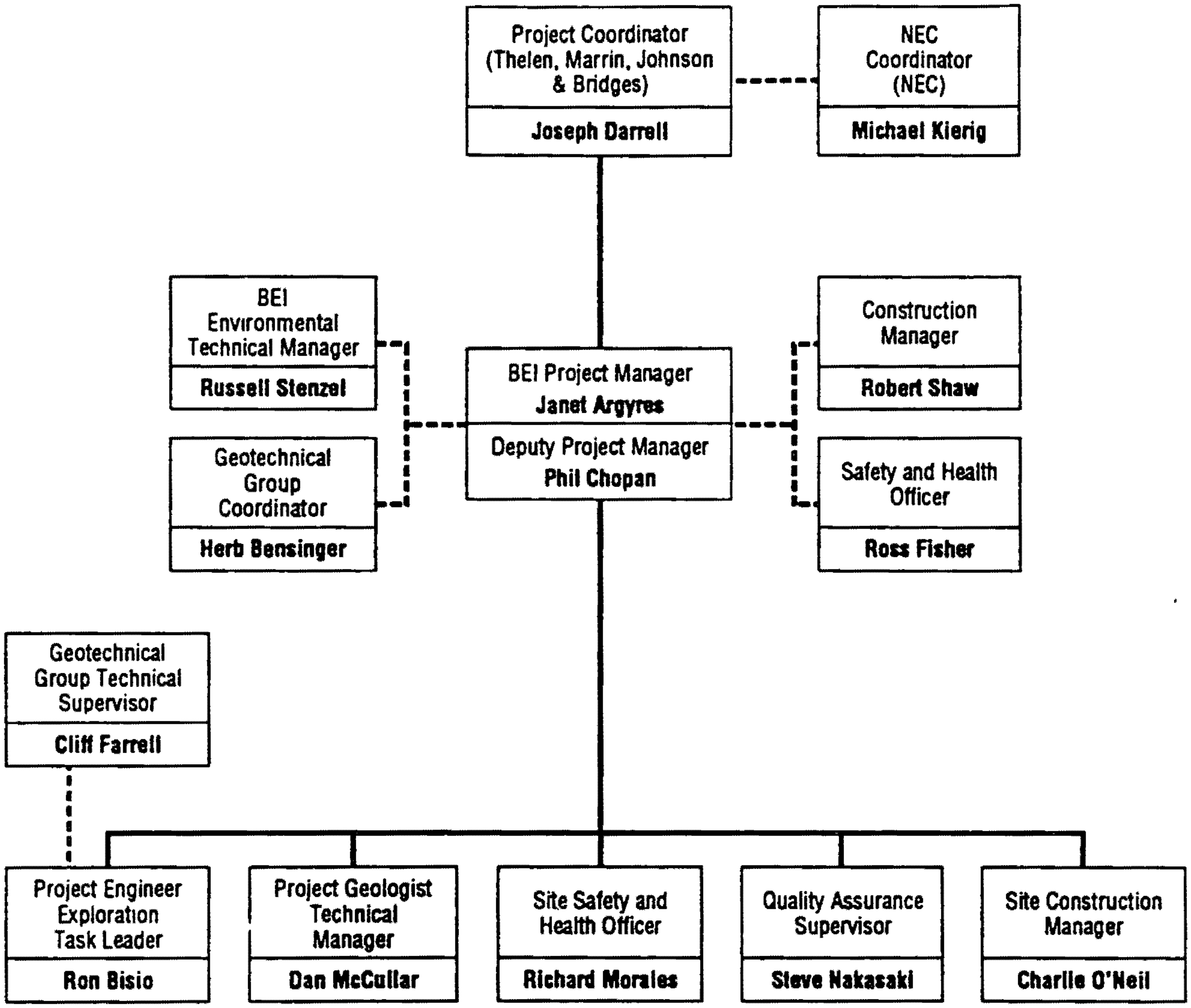
A Technical Manager was present on site throughout the remediation. He was responsible for executing all of the on-site remediation activities, including supervision of the drilled shaft installation, aeration activities and backfill operations. A Site Construction Manager coordinated the subcontractor activities during the remediation work. He established the temporary facilities on site and coordinated with the NEC facilities personnel for utilities and other similar needs to facilitate execution of the contract work. He also maintained a record of materials and quantities for the site remediation activities.

1.5.4.3 Subcontractors

The field activities for the remedial action involved a number of contractors and subcontractors as listed below and discussed within the report under appropriate headings:

- Baker Tanks Inc. of Rancho Dominiguez, CA
- Cameron-Yakima, Inc. of Yakima, WA.
- Clear Heart Construction & Drilling Company of Guerneville, CA
- Excel Trans Inc. of Benicia, CA
- Ferma Corporation of Mountain View, CA
- Oscar E. Erickson, Inc. of Richmond, CA
- Sequoia Analytical Laboratories of Redwood City, CA
- Towill Inc. Surveying of Concord, CA
- Underground Location Services Company of Menlo Park, CA

To coordinate the remediation activities, all of the contractors and subcontractors reported to the BEI Project Manager or other designated BEI personnel.



Bechtel
San Francisco

NEC Electronics, Inc.
501 Ellis St., Mountain View, CA

Remediation Project
Organization Chart

JOB NO.	DRAWING NO.	REV.
17660		

17660/2/og/NEC/307
2-25-92 tg/ vk 1

Section 2
Soil Exploration

The results of previous investigations indicated hot spots with TCE concentrations above the cleanup standard within two areas located east of the 501 building. Based on these findings, it was determined that a final exploration program would be prudent to further define the boundaries of the hot spots prior to soil remediation. This section describes the final exploratory program, summarizes the exploration procedure, and presents the results of the final exploration.

2.1 Exploration Areas

The proposed locations of the final exploratory borings in Area 1 and Area 2 were provided in the RDD as discussed in Section 1.4 of this report and shown on Figures 5 and 6. The boundaries of these two areas (Areas 1 & 2) were based on the previous soil borings (Phase IV investigation) and the locations of the proposed final exploratory borings were based on a triangular grid spacing of 5.6 feet as discussed in the RDD.

Prior to final exploration, the locations of the previous and proposed borings were surveyed to accurately define the boundaries of exploration areas. Where on-site obstructions denied access, minor adjustments were made to the locations of the proposed borings and/or supplemental borings were added in order to maintain the 5.6-foot triangular grid spacing requirement. Also, a few supplemental borings were advanced during the course of the exploration, prompted by the results of field analyses as discussed later in this section. Upon completion of all the borings, the actual locations of the borings were resurveyed. Surveying was performed by Towill, Inc. of Concord, California.

The soil borings completed during this project are designated in this report as the final exploratory borings and are numbered R-1 through R-36. The surveyed locations of all the borings within Area 1 and Area 2 are presented in Figures 7 and 8, respectively.

2.2 Exploration Procedures

2.2.1 Health and Safety Procedures

The health and safety procedures, observed during the site exploration, complied with the guidelines provided in the RDD: Volume II, Appendix 3, Safety, Health, and Emergency Response Plan (SHERP). Level D, and occasionally Level C, protective equipment were used as required and as discussed in further detail under Subsection 3.3 of this report.

2.2.2 Drilling

The final exploratory borings were drilled, sampled, and backfilled by a drilling contractor (Clear Heart Construction and Drilling Company of Guerneville, CA) under the supervision of a Bechtel geologist. A Giddings truck-powered, portable drill rig was used to drill nine boreholes inside the 501 building and three immediately outside the 501 building where access was restricted. A Failing F-100A, truck-mounted, drill rig was used to drill the other twenty four boreholes. The drill rigs were equipped with 6-inch outside diameter (O.D.) hollow-stem augers. The drill rigs were decontaminated with a steam cleaner upon arrival at the site, periodically during the course of the field work, and prior to demobilization. Down-hole equipment, including augers, bits, rods, and samplers were also steam cleaned prior to drilling each borehole.

The sampling equipment was decontaminated prior to each use as described in Subsection 2.3.2. All decontamination wash water was collected and temporarily stored in an on-site portable Poly tank provided by Baker Tanks Inc. of Rancho Dominiguez, CA. Upon completion of the field activities, the contents of the tank were properly disposed of as described in Subsection 3.9.2.1.

All drill cuttings and excess soil samples were temporarily stored in an on-site roll-off bin provided by Oscar E. Erickson, Inc. of Richmond, CA. The bin was covered with plastic every night. These soils were properly disposed of later along with the excavated soils from the remediation activities. Following completion, each borehole was backfilled with cement, or a cement-bentonite grout, and capped with asphalt or concrete, depending on location.

2.3 Sampling Procedures

2.3.1 Sample Collection

Continuous soil samples were collected above the ground-water table between depths of approximately 1 and 16 feet. Soil samples were collected using 18-inch long stainless steel split-barrel samplers of 1.5-in O.D. (standard penetration test sampler), 2.0-inch O.D., and 2.5-inch O.D. Soil samples for field and laboratory chemical analyses were collected from every other 18-inch sampling interval (that is, once every three feet) using either the 2.0-inch O.D., or 2.5-inch O.D. samplers which contained decontaminated brass sample liners. In the intervening 18-inch sampling runs soil samples were collected for geologic logging purposes only. The samplers were advanced using a standard 140-lb drop hammer falling 30 inches.

Each brass sample liner consisted of three 6-inch long tubes. Depending on the recovery of a sample intended for field and laboratory analyses, the middle liner tube was generally prepared for laboratory shipment unless only the bottom liner tube was completely filled. The appropriate liner tube was then prepared for laboratory shipment as described in Section 2.3.2. Samples for field analysis were taken from one of the two remaining liner tubes. Remaining samples in the liner tubes were inspected in the field for geological logging purposes.

2.3.2 Sampling Protocol

When the soil sampler was retrieved from the exploratory boring, one of the 6-inch long brass tubes (usually the middle tube) was removed. The ends of the tube were covered with Teflon tape, capped, and sealed with duct tape. The samples were then labeled, sealed in plastic bags and immediately placed into a cooler containing ice. At the end of each day, the samples were transported to the Laboratory in an ice cooler. A Chain-of-Custody form was filled out for each set of samples. For each sample, the sample identifications, sampling time and date, preservative, and requested analyses were recorded on the chain-of-custody form. Upon arrival at the Laboratory, the samples were immediately logged in and stored at 4°C. The Chain-of-Custody was signed by the sampler and the Laboratory sample custodian to document transfer of the samples to the Laboratory.

Samples for field analysis were taken from the end of the brass liner below and immediately adjacent to the tube used for the laboratory sample. These samples were taken by first scraping off the upper quarter inch of soil and then inserting a 0.5-inch diameter copper tube into the newly exposed soil. A plug of soil, weighing about 10 grams, was removed and placed into a preweighed, 40-ml VOA vial, containing 20 milliliters of distilled water. The sample was labeled, agitated to breakup the soil, and immediately analyzed in the field using a Photovac gas chromatograph as described in Subsection 2.5.2.

Sampling equipment was decontaminated by washing in a non-phosphorous soap solution followed by a rinse in tap water and a rinse in distilled water.

2.4 Sample Description and Soil Stratification

Soil samples from the 36 final exploratory borings were logged and visually described by a BEI on-site geologist following the Unified Soil Classification System, ASTM D 2488 (summarized in Table 2), and the Geologic Society of America Rock-Color Chart (1948). The geologic drill logs for each borehole are included in Appendix A. Four subsurface profiles were prepared from the drill logs of selected boreholes as shown in Figure 9. Subsurface profiles A-A' and B-B' are located in Area 1. Subsurface profiles C-C' and D-D' are located in Area 2. The locations of these profiles are shown in Figures 7 and 8.

In general, the soil borings encountered the same materials as reported in previous investigations: an asphalt or concrete surface cover underlain by artificial fill to a depth of 1 to 2 feet; silty clay to a depth of approximately 9 feet; gravelly sand to silty sand to a depth of approximately 14 feet; and clay and silt to the drilling depth of 16 feet. The boreholes were not intended to penetrate the ground-water table and were terminated at a depth of about 16 feet below grade: the approximate depth of ground water in existing wells at the time of the final exploration. Although the ground-water table was not penetrated, the capillary fringe was encountered in most of the boreholes.

2.5 Analytical Procedures

This Section described the analytical parameters and methods employed for analyses of soil samples from the exploratory borings and soil samples obtained during the remediation activities.

2.5.1 Analytical Parameters

Soil remediation was designed to achieve the TCE cleanup standard of 0.5 mg/kg. Therefore, the exploratory analyses and cleanup verification were both based on TCE analyses only. Both field and confirmatory laboratory analyses were performed on selected soil samples.

The laboratory samples were analyzed for TCE by EPA Method 8010. Ten percent of the laboratory samples were also analyzed for the parameters indicated on Table 3. This table includes all of the 15 chemicals of concern identified in the Order for the MEW site as discussed in Section 1.4 of this report. Table 3 also includes two additional compounds, toluene and trichlorobenzene, selected because of the site history. The laboratory analytical methods used for all 17 compounds are also provided in Table 3.

The additional analyses on ten percent of the samples were performed for documentation purposes only. The results of these analyses were not used to verify cleanup since TCE is the only compound for which a cleanup standard is established in the Order.

Field analyses on the soil samples were performed using a Photovac portable gas chromatograph (Photovac) or an HNU photoionization detector (HNU) as described in Subsection 2.5.2.

2.5.2 Field Analysis

The instrument used for field analysis of soil samples was a Photovac model 10S50 portable gas chromatograph (Photovac) equipped with a Chrompack CPSil 5 CB capillary column and a photoionization detector. Hydrocarbon-free air was used as the carrier gas and the isothermal oven was maintained at 40°C. The Photovac was calibrated and operated as described in the RDD (Volume II, FSP and QAPP). Results of quality control samples are presented in Subsection 2.5.4.

Before analysis, the 40 ml soil sample vials were reweighed to determine the amount of soil present to the nearest 0.1 gram. The soil/water slurry was mixed by vigorous shaking until all solids were broken up and allowed to equilibrate for at least 5 minutes. A headspace vapor sample was then extracted from the vial using a gas-tight syringe, the vapor was then injected into the Photovac. A chromatograph produced peaks corresponding to the volatile compounds present in the soil. A comparison of the sample peaks to peaks of known standard concentration was used for sample quantification. This method was developed by Dr. Thomas M. Spittler at the U.S. EPA Region I laboratory in Lexington, MA (US EPA, June 1983) and is based upon the relationship between the concentration of TCE in the water and the concentration in headspace. Every sample was analyzed at least twice, and the mean concentrations were reported. Detection limits were calculated from the lowest confident quantifiable amount detectable. The Photovac readings were recorded in mg/kg (ppm) of the soil sample.

An HNU, Model 101, photoionization detector (PID) was also used during exploration to initially screen the soil and to assist in taking appropriate safety measures. The HNU was calibrated with a 100 ppm isobutylene standard. Ambient air concentrations were measured in the breathing zone and at the borehole. The HNU was also used to measure concentrations of volatile organics in air given off by freshly exposed soil, using one or both of the following two methods: The first method involved extruding a plug of soil from the brass liner, cracking it and then immediately measuring the air concentration next to the exposed soil. The second method consisted of placing freshly extruded soil in a plastic bag, sealing it, mixing the soil and allowing it to equilibrate for a few minutes. The HNU probe was then inserted into the head space in the bag and a reading was taken.

The HNU readings were recorded in ppm of organics in air, indicating very approximately the order-of-magnitude values for total VOC's. These values were used as rough guidance on sample selections for field Photovac analyses and laboratory analyses. The HNU readings were also used to determine the level of personal protective equipment required for safety as described in Section 3.3 of this report.

2.5.3 Laboratory Analysis

Sequoia Analytical of Redwood City, CA (Laboratory) performed the laboratory analysis on selected samples requested for analyses. Each of these samples was analyzed within the appropriate holding time and per test methods requested on the accompanying Chain-of-Custody. The test methods for various parameters are listed in Table 3.

Some of the samples submitted to the Laboratory were not designated for analyses, and were archived for possible future analyses and will be preserved by the Laboratory for one year.

The Laboratory will also retain all NEC analytical records for three years. After that time, these records will be delivered to NEC to archive for a minimum of ten years following the completion of the work as required per Section XXI of CERCLA §106 Administrative Order.

2.5.4 Quality Assurance/Quality Control

The field activities and chemical analyses performed during the remedial work at the site were in general accordance with the procedures described in Volume II of the RDD (Appendix 2, Quality Assurance Project Plan, QAPP). This Subsection briefly summarizes the quality assurance procedures, presents the results of analyses on the quality control samples, and provides a discussion of the data quality.

2.5.4.1 Field Quality Control

Field procedures such as soil sampling, sample handling, sample custody, and equipment decontamination were performed according to the QAPP. Field quality control samples consisted of travel blanks and equipment blanks. Travel blanks were submitted with 16 of the 18 sample shipments to the laboratory. An equipment blank, which consisted of rinsate resulting from pouring distilled water through a decontaminated soil sampler, was also taken. No volatiles were found in any of the blanks. Because of the heterogeneity of the site soils, no soil duplicates were taken in the field.

2.5.4.2 Analytical Quality Control

Photovac - The quality control results for field chemical analyses indicated very dependable data quality as described below. TCE standards were prepared daily. Blanks, spikes and replicates were analyzed daily. Syringe blanks were run before every sample to detect any sample cross-contamination. Water blanks and sample vial blanks were analyzed to verify equipment cleanliness. No interfering analytes were detected. Every sample was analyzed at least twice, with the mean of the replicates reported. The Relative Percent Difference (RPD) of sample replicates averaged 5.0% with a standard deviation of 5.7%. A sample matrix spike of TCE was performed daily. Recoveries averaged 95% with a standard deviation of 14%. Completeness, which is measured as the percentage of useable data obtained relative to data objectives, was calculated at 99%. With greater than 99% confidence, accuracy and precision results were within the data quality objectives established in the QAPP and completeness results exceeded data quality expectations.

Laboratory - Laboratory quality control was performed according to, and at the frequency described in, the QAPP. In addition, all TCE results for soil samples analyzed by EPA Method 8010 were accompanied by data validation packages as outlined in the following document: ***EPA, QA-07-90, Laboratory Documentation Requirements for Data Validation, January 1990*** (US EPA, January 1990).

As part of the performance audit, a blind blank was submitted to the Laboratory. However, a blind soil duplicate was not submitted due to soil heterogeneity. The results of general data validation indicate valid, useable data. Holding times for all analytical methods were met for all samples. No contaminants were found in the laboratory method blanks. With a greater than 92% confidence, accuracy and precision results were within the data quality objectives established in the QAPP and completeness results exceeded data objectives. Laboratory quality control results are presented in Table 4.

2.6 Exploration Inside The Building

2.6.1 Extent of Exploration

Boring numbers R-1, R-2, R-3, and R-5 (Figure 7) were originally proposed to define the boundaries of Area 1 inside the 501 building. However, during the exploration, field analyses indicated that boring R-1 may not meet the cleanup standard. Rather than wait for the results of confirmatory laboratory results, supplemental borings were made inside the building to expedite the exploration program. These borings were numbered R-6, R-7, R-10, R-11, and R-12.

Expediting the exploratory borings was essential for the following reasons:

- The remediation work was extending into the rainy season and, therefore, needed to be completed as soon as possible;

- A special low-boom drill rig was used inside the building and the rig would not be available later in the year; and
- The goal was to complete remediation activities before the end of the year when the property lease was to expire.

Thus, the supplemental borings were completed before the results of the laboratory analyses were available. However, the results of the laboratory analyses, as discussed in Subsection 2.6.3, did indicate that soil samples from boring R-1 met the cleanup standard. The maximum TCE level in this boring was reported to be only 0.33 mg/kg at a depth of 6.5 feet below grade, and the average of all the samples from the boring showed a TCE level of 0.19 mg/kg which is considerably below the cleanup standard of 0.50 mg/kg.

2.6.2 Results of Field Analyses

The statistical evaluation of the Photovac analyses performed on the soil samples is summarized in Table 5. This table presents the maximum, minimum and mean values of TCE detected in each of the 9 borings sampled inside the building. As indicated in the table, a total of 45 soil samples were obtained from these 9 borings during the exploration. The mean concentration of TCE for all of these samples was 0.38 mg/kg. The results of Photovac analyses on individual soil samples from each boring are presented in Table 6. These results were used for the statistical evaluation presented in Table 5.

In addition to Photovac analyses, field testing also included HNU readings which were taken at the top of the boreholes during various stages of exploration, on the soil material obtained from various depths, and in the working area around each boring. The HNU readings for all of the borings are presented in Appendix B, Table B-1.

The results of the field analyses were used to select soil samples for laboratory analyses. In all cases, the laboratory samples included the sample showing the highest TCE concentrations per field analyses.

2.6.3 Results of Laboratory Analyses

Statistical evaluation of the laboratory analyses performed on 36 soil samples from nine borings inside the building are summarized in Table 7. This table presents the maximum, minimum and mean values of TCE detected for each of the nine borings sampled inside the building. As indicated in the table, the mean concentration of TCE for all of the 36 samples was 0.11 mg/kg. The mean value for the TCE level detected in all the soil samples from each boring ranged from 0.013 mg/kg in boring R-11 to 0.36 mg/kg in boring R-6. The laboratory test results on the individual soil samples from each boring are presented in Table 8.

Ten percent of the laboratory samples were also analyzed for parameters other than TCE as listed in Table 3. The results of these analyses are summarized in Table 9 for documentation purposes only. The laboratory reports, the relating QA/QC data, and the chain-of-custody forms for all of the laboratory samples from the exploratory borings are presented in Appendix C.

2.6.4 Conclusions

As presented in Table 7 and Subsection 2.6.3 above, the laboratory results indicate a mean value of 0.11 mg/kg for TCE concentrations in all of the 36 soil samples analyzed from 9 borings inside the building. The mean concentration is considerably below the cleanup standard of 0.5 mg/kg. The standard deviation for the 36 samples was 0.14 mg/kg. Only one sample out of the 36 samples showed a TCE concentration slightly above the cleanup standard: 0.55 mg/kg, at a depth of 12.5 feet below grade in boring number R-6. The maximum level of TCE in each of the remaining 8 borings ranged from 0.019 to 0.37 mg/kg, well below the established cleanup standard.

Considering the TCE concentration levels detected in the soil samples from the nine indoor exploratory borings, soil remediation was not extended beneath the 501 building. Soil remediation at the site was limited to outside the building as presented in Section 3 of this report.

2.7 Exploration Outside the Building

2.7.1 Extent of Exploration

Thirteen exploratory borings were performed in Area 1 outside the 501 building as shown in Figure 7. These borings were designated as R-4, R-8, R-9, and R-27 through R-36. Boring R-36 was a supplementary boring added to the originally proposed borings because TCE was detected in Boring R-35 as discussed later in this Section.

Fourteen exploratory borings were made in Area 2 as originally proposed in the RDD. No supplemental borings were required in Area 2 since all the borings were "clean" as discussed later in this Section. The borings in Area 2 were designated R-13 through R-26 (Figure 8).

2.7.2 Results of Field Analyses

The results of Photovac analyses conducted in the field on 63 soil samples from the thirteen borings in Area 1 (outside the building) are presented in Table 10. As indicated in this table, only samples from R-9 and R-35 had TCE levels exceeding 0.5 mg/kg. Soil samples from the remaining 11 borings had TCE levels well below 0.5 mg/kg.

The results of the Photovac analyses performed in the field on 70 soil samples from the 14 borings in Area 2 are presented in Table 11. This table shows that none of the soil samples had TCE concentrations exceeding 0.5 mg/kg.

The field analyses were confirmed by laboratory analyses as discussed in the following subsection.

2.7.3 Results of Laboratory Analyses

Table 12 presents the results of laboratory analyses on 27 soil samples obtained from 13 borings within Area 1 outside the building (R-4, R-8, R-9, and R-27 through R-36). The results of the analyses confirm that the TCE cleanup standard is exceeded in only two of the borings: R-9 and R-35, as indicated previously by the field analyses.

The results of the laboratory analyses for 28 soil samples from 14 borings in Area 2 are summarized in Table 13; none of the samples exceeded the TCE cleanup standard.

The results of the laboratory analyses on ten percent of the samples analyzed for parameters other than TCE (Table 3) are summarized in Tables 14 and 15 for Area 1 and Area 2, respectively. These results are presented for documentation purposes only.

The laboratory reports, the relating QA/QC data, and the chain-of-custody forms for all the laboratory samples are presented in Appendix C.

2.7.4 Conclusions

As a result of the TCE concentrations detected in Borings R-9 and R-35 of Area 1, the excavation area surrounding one of the hot spots (Figure 7, old boring number 104), was enlarged. The planned extent of the excavation in Area 1 was modified to incorporate the new findings from borings R-9 and R-35 as discussed further in Subsection 3.1.

None of the borings in Area 2 indicated TCE concentrations above the cleanup standard. Therefore, no modification was made to the extent of the originally proposed excavation boundaries which surrounded the only identified hot spot within Area 2 (Figure 8, old boring number SB-25).

Section 3
Soil Remediation

This Section summarizes the remediation procedures; describes the planned remediation areas and schedule of activities; summarizes the health and safety program and air monitoring procedures; and provides a detailed description of the site preparation, excavation, aeration, backfill, waste disposal, and restoration activities.

3.1 Planned Remediation Areas

The planned excavation areas at the site are presented in Figure 10 for Area 2 and Figure 11 for Area 1. The extent of these excavation areas was based on the Phase IV investigation and the results of the final exploratory borings. As previously discussed in Subsection 2.7, none of the final exploratory borings in Area 2 indicated TCE levels exceeding the cleanup standard. Therefore, excavation in this area was limited to the one hot spot previously identified in the RDD. Four overlapping auger-holes (numbered 1 through 4) were planned to cover the required excavation area as originally proposed in the RDD.

Twenty-one auger-holes (numbered 5 through 25) were planned for Area 1, as indicated in Figure 11. Auger-holes 13 through 25 were planned as an expansion of the originally proposed excavation area around boring number 104 from the Phase IV soil investigation (Figure 7). The expansion of the excavation in this area was necessary since the TCE concentrations in some of the soil samples from the exploratory borings R-9 and R-35 exceeded the cleanup standard as discussed in Subsection 2.7.3. The planned excavation areas were further expanded during the actual excavation as discussed in Subsection 3.6.5. This further expansion was accomplished by adding auger-holes 26 through 37 as shown in Figure 12.

3.2 Schedule of Remediation Activities

The exploration program and soil remediation activities were overlapped somewhat in order to expedite the site cleanup. Upon completion of exploration, the excavation areas were defined and the boundaries were laid out at the site. An OSHA qualified excavation contractor (Ferma Corporation of Mountain View, CA) was selected and mobilized on site on November 25, 1991. The schedule for the main activities is presented in Figure 13 which shows that the land survey was initiated on October 29, 1991, the exploration started on November 6 and the excavation contractor mobilized on November 25, 1991.

After the exploration program was basically completed on November 22, 1991, the site preparation, surveying and start-up activities began immediately. Excavation started on December 2 and was completed on December 14. Soil aeration was completed on December 17. Site restoration, decontamination, demobilization and non-hazardous waste disposal (solid and liquid) continued through December 31, 1991, the date on which remediation activities were concluded.

3.3 Site Health and Safety Program

This Subsection summarizes the primary site-specific health and safety procedures conducted by Bechtel Environmental Inc. (BEI) during remedial activities at the site. The guidelines for these procedures were adopted from the Safety, Health and Emergency Response Plan (SHERP) provided in the remedial design document (RDD, Volume II, Appendix 3).

3.3.1 Regulatory Compliance

The format and contents of the SHERP were developed based on the following:

- 29 CFR 1910.120, Hazardous Waste Safety Regulations;
- Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities;
- NIOSH/OSHA/USCG/EPA October 1985, Pub. No. 85-115; and
- The US EPA Standard Operating Safety Guidelines, Office of Emergency and Remedial Response, Hazardous Response Support Division, Revised November 1984.

The exploratory drilling contractor (Clear Heart), and the excavation contractor (Ferma), adopted the SHERP in lieu of preparing their own health and safety plans. Although each contractor was directly responsible for health and safety of their on-site personnel, each contractor was required to follow, as a minimum, the procedures described within the SHERP. BEI's primary responsibilities were to perform air monitoring at the site and ascertain that the site personnel complied with the site-specific health and safety procedures outlined in the SHERP.

3.3.2 Site Specific Activities and Records

Site activities included exploratory drilling, excavation of contaminated soils by means of helical and bucket augering, and soil aeration. Records required by the SHERP were maintained in the BEI on-site office trailer by the BEI Site Manager and Site Safety and Health Officer (SSHO). OSHA compliance for conducting work at a hazardous waste site and relevant regulatory compliance were documented in these records which included:

- OSHA Hazwoper training records for the site personnel,
- Respirator fit test records if needed,
- Field instrument calibration records,
- Air monitoring pump calibration records,
- Tool box safety meeting records,
- Health and safety daily logbook,
- Material safety data sheets, and
- Equipment mechanical inspection reports.

The site layout, which consisted mainly of a paved flat and spacious area, easily accommodated the site specific work conditions which included: multiple small working areas, multiple access needs, and frequent moves required for heavy equipment. Most of the work was performed in a personal protective equipment (PPE) ensemble consisting mainly of Level D, and occasionally Level C, as described in the SHERP. Level C was determined on the basis of the air monitoring as discussed in Subsection 3.4.

Exclusion zones (EZ), contamination reduction zones (CRZ), and the support zones (SZ), were established prior to each major portion of the remedial work and clearly marked. These zones changed as the various parts of the site underwent remediation.

Personnel decontamination was performed in accordance with the SHERP whenever any site personnel had to doff Level C PPE or exit the EZ. Small, hand-held equipment was decontaminated at the equipment drop-off station in the CRZ each time the equipment was removed from the EZ. Heavy equipment was left in the EZ until the completion of work, at which time the portions of the equipment in contact with potentially contaminated soils were steam cleaned.

Decontamination liquid was collected and pumped into an on-site portable Poly tank. The liquid in the tank was later analyzed for appropriate disposal, as described in Subsection 3.9.2.1.

3.4 Air Monitoring

Two methods of air monitoring were performed by the Site Safety and Health Officer as specified in the RDD. The first method was air monitoring around the perimeter of the remediation area. This was performed using five air pumps and collecting air samples at five locations around the remediation area (Figure 14). The second method involved utilizing a direct reading instrument (HNU) capable of measuring VOC's. The HNU readings were used for the determination of the PPE level for personnel protection, perimeter surveys, and for screening newly excavated soils. The HNU readings helped determine the appropriate levels of VOC's present in the ambient air and/or soil pore space.

Monitoring for dust and particulates was not needed in the remediation area, since the excavated soil was sufficiently moist and no strong wind was observed during the performance of the field activities. Wind direction was monitored by a windsock installed at the site as described in Subsection 3.4.1. Dust suppression on the clean imported soil was achieved with periodic water spraying. Monitoring for flammable vapors or oxygen was not needed because, (1) VOC levels rarely exceeded 20 ppm in the ambient atmosphere, and (2) VOC levels within the top of the excavation never exceeded 400 ppm, as measured with the HNU. The HNU readings throughout the remediation period are presented in Appendix B, Table B-2. Frequent low readings or zero readings were generally not recorded to avoid unreasonably long documentation.

3.4.1 Perimeter Air Monitoring

Perimeter air monitoring was performed by using small pumps to draw air through a carbon-molecular sieve glass tube. The sample tubes were sent to a certified laboratory (Sequoia Analytical) and analyzed using EPA Method TO2. The pumps were calibrated with a primary standard flow calibrator (Gilian, The Gilbrator, Control Unit PN-D800268). This calibrator unit makes field air flow calibrations traceable to a National Bureau of Standards primary standard. The pump rate was specified by Method TO2 and consisted of 72 liters of air per day (per 8-hour shift).

After a sampling event, the calibration of each pump was rechecked to verify that the flow rate had not varied by greater than ten percent. All calibrations during the air sampling indicated that pump rates were within the tolerance of the method.

Wind direction was monitored during the sampling events by utilizing a windsock, located as shown in Figure 14. The windsock was located such that obstructions to the wind, such as buildings and trees, would not cause erroneous windsock readings.

Background perimeter air monitoring was performed on November 12, 1991, before the remediation activities (excavation and aeration) began at the site. Five locations were selected based on the existing wind conditions for that day. The locations included two upwind locations (pump numbers 8090 and 3007) and three downwind locations (pump numbers 9606, 3822, and 3351) as shown in Figure 14. The locations were selected in evenly spaced intervals, as much as possible, to adjust for any changes in the wind directions. It was observed throughout the project that very little or no wind (< 5 mph) was present at the site. Because of this observation, the pump locations for perimeter air monitoring during soil remediation remained the same as the pump locations for the background monitoring.

Perimeter air monitoring during soil remediation was performed at five locations around the remediation area with the exception of one time when a pump failed to calibrate properly. Perimeter air monitoring with pump sampling was performed twice during remediation: on December 6 and 10, 1991. The analytical data on these air samples, accompanied with HNU surveys, indicated that very little or no VOC emissions were migrating outside the remediation area. Therefore, air sampling with the pumps was discontinued on December 10, but the remediation area was frequently surveyed with the HNU to identify the need for further air sampling at the perimeter. As discussed in Subsection 3.4.2, no additional air samples were obtained after December 10, 1991.

3.4.2. Perimeter Air Monitoring Results

The results of laboratory analyses on the air samples obtained during remediation are summarized in Tables 16 through 18 as discussed below. The Laboratory Reports are presented in Appendix D.

Background perimeter air monitoring was performed prior to the remediation activities, on November 11, 1991, as described in Subsection 3.4.1. The results of background perimeter air monitoring analyses are presented in Table 16. A total of three VOC parameters were detected in all five samples. The VOC's detected and their ranges are as follows:

- 1,1,1-Trichloroethane (0.024-0.18 nanograms per liter - ng/L),
- Benzene (0.038-0.0.16 ng/L), and
- Toluene (0.077-0.37 ng/L).

Perimeter air monitoring was performed on December 6 and 10, 1991, during the early stages of the soil aeration process. The results of these analyses are presented in Tables 17 and 18 for the December 6th and 10th sampling events, respectively. As indicated in these two tables, a total of four VOC parameters were detected in the samples collected during remediation. The VOC's detected and their ranges are as follows:

- 1,1,1-Trichloroethane (0.71- 13 ng/L),
- Benzene (2.6- 16 ng/L),
- Toluene (2.0- 35 ng/L), and
- Trichloroethene (0.51-0.82 ng/L).

Additionally, one sample detected methylene chloride at 19 ng/L (Table 18). Although a trip blank was sent to the Laboratory with the perimeter air monitoring samples, the blank sample was not analyzed for methylene chloride because the detected level is several orders of magnitude below the levels set by National Institute of Safety and Health (NIOSH) for the Time Weighted Average (TWA) as indicated in Table 18.

Tables 17 and 18 present the perimeter air monitoring results as compared to the NIOSH TWA's for each VOC detected. The TWA's are commonly interpreted in units of mg/m^3, as measured in an occupational setting. The EPA TO2 method is an ambient (usually outdoor) measurement and no standard has yet been developed to compare values, so NIOSH values were used. EPA TO2 values are reported in units of weight of contaminant per volume (ng/L) of air pumped over a certain period of time. The reported value is then converted to mg/m^3, and the time is extrapolated to represent a NIOSH value. Therefore, the reported values in Tables 16, 17, and 18 have been converted from ng/L to mg/m^3. The corresponding TWA is also presented in the tables for direct comparison. The following equation was used to convert the laboratory values:

$$ng/L\ (1000L/m^3)\ \text{X}\ (1mg/10\,E6\,ng) = mg/m^3$$

A review of the perimeter air monitoring results demonstrates that the detectable levels of airborne contaminants is on the average six orders of magnitude smaller than the acceptable TWA values. It was evident from the data during the early soil aeration process that no appreciable VOC emissions were migrating off site. Therefore, the perimeter air sampling was discontinued for the remaining portions of remediation, but the perimeter monitoring was continued using HNU survey. Air sampling by the pumps was to resume if HNU survey readings showed detectable VOC levels along the perimeter of the property. No such levels were detected by HNU throughout the remaining portion of the remedial activities. Therefore, no air samples were obtained after December 10, 1992.

3.4.3 Personal Air Monitoring

Personal air monitoring was conducted continuously throughout the project with the use of an HNU, and occasionally with color indicator tubes. During exploratory drilling, the HNU readings were used to measure VOC's at the top of each borehole and in the breathing zone of the drilling crew. Air monitoring was conducted most frequently when drilling was inside the building, because it was an enclosed space with relatively low ventilation.

During the course of exploratory drilling inside the building, and occasionally when drilling outside the building, the drilling crew donned respirators voluntarily, although HNU readings rarely exceeded the SHERP action level of 10 ppm. BEI personnel donned respirators less frequently as they were generally farther away from the drilling rig. Color indicator tubes did not identify any of the suspected VOC's during air monitoring.

Continuous air monitoring was conducted during all phases of the soil excavation as an integrated activity of the soil screening operation. During the excavation of the auger-holes, ambient air was monitored with the HNU near each hole and in the breathing zones of workers within the areas of potential exposure to VOC emissions. Throughout the excavation process, HNU readings in the immediate breathing zone of the remediation crew ranged from nondetectable to 400 ppm. Workers in the immediate area of the excavation generally donned respiratory protection when HNU readings reached 5 ppm, in anticipation of greater VOC emissions. VOC emissions generally increased with the borehole depth; the highest readings were usually found in a depth range of 12 to 14 feet below grade.

In summary, VOC emissions during soil excavation were, on some occasions, at or above the criteria requiring respiratory protection. Personal air monitoring with the HNU provided the information necessary for proper protection. Potential exposures were generally only a few seconds during the high VOC emissions, and personnel had donned respiratory protection well before these high emissions were encountered. No workers in the exclusion zones complained of exposure symptoms, and no abnormality was observed throughout the excavation and aeration process.

3.5 Site Preparation

3.5.1 Start-up Operations

Start-up operations consisted of the following major activities:

- Updating the site utility survey
- Laying out the excavation areas
- Setting up the decontamination equipment on site
- Designating laydown areas for the contractor's equipment
- Marking off the areas for soil aeration (Aeration Pads 1 through 5).

The underground utility survey was conducted by Underground Location Services Company of Menlo Park, CA to identify the locations of any subsurface utilities or obstructions in the intended drilling and excavation areas. In addition, the

Underground Service Alert (USA) located all the major public utility lines in the area.. The safety zones, the aeration pads, the temporary stockpile areas and the planned excavation areas were marked off using red and yellow tapes. Plastic liners and absorbant pads were brought on site to use as protection against possible rain and control the resulting run-on/run-off.

A 6,500-gallon Poly tank was provided by Baker Tanks, Inc. of Ranch Dominiguez, CA for temporary containment of decontamination water. The site safety zones and safety procedures were established as discussed in the Subsection 3.3.

Little site preparation was necessary as the site was relatively flat and paved. The main site preparation operation consisted of removing a Cansorb unit from Area 1 as discussed below.

3.5.2 Removal of Cansorb Unit

A small ground-water treatment unit (referred to as the "Cansorb unit") was located above ground, immediately east of the 501 building. The Cansorb unit had to be removed as it was obstructing the planned excavation in Area 1 (Figure 7). The Cansorb unit consisted of two 55-gallon drums within a small fenced area. The drums contained granulated carbon filters which had been used in the past, during a pilot test program, for pumping and treating ground-water from the nearby monitoring well number 3A. The drums were supported on a wood crate placed on the pavement within the fenced area. The Cansorb unit was connected to well number 3A via underground pipes.

The electric and piping lines to the Cansorb unit were disconnected by Shannon Pump Company on November 8, 1991. The piping connections were removed and placed next to the drums. On November 26, the excavation contractor removed the chainlink fence surrounding the Cansorb unit, cut the remaining pipe at the ground level, and dismantled the unit. An underground electrical conduit and a buried water line, each consisting of a one-inch galvanized steel pipe, connected the Cansorb unit to the monitoring well number 3A. Both pipes were encased in concrete about one foot below the surface.

A small backhoe, equipped with a one-foot wide bucket, was used to excavate and remove the underground pipes. The backhoe was used to remove the concrete and break the pipes free. The pipes were cut into sections with a metal saw. The piping extended through, and terminated inside, the Christie box of well number 3A. These pipes were disconnected and removed from the Christie box without damaging the box. The submersible pump had been removed previously during the pilot testing program in 1990.

Since the Cansorb filters were used for treatment of ground water pumped from monitoring well number 3A, and since the highest TCE concentrations recorded for any of the water quality samples from this well was 900 ppb (BEI, 1991, Routine Ground-Water Monitoring Report), it was considered prudent to assume that the granulated carbon filter units inside the two drums might be hazardous. Therefore, all piping removed from the Cansorb unit was steam cleaned. The rinsate water was collected and temporarily contained in the on-site portable Poly tank. Both drums were drained and less than one gallon of water was removed from each drum. Each drum was tested with the HNU which yielded readings of one and ten ppm.

The two drums were moved to a temporary storage area, placed on a wood crate, and covered with two layers of dark plastic liner. The drums were securely wrapped in plastic, labeled, and temporarily stored on site for disposal at a permitted off-site recycling facility as described in Subsection 3.9.1.

3.6 Excavation Activities

3.6.1 Pavement and Subbase Removal

The asphalt pavement, and the subbase material within the planned excavation areas, were removed using a jack hammer and a backhoe. The asphalt was approximately two inches thick and the subbase was about 12 inches. Some granular material underneath the subbase was also removed to expose the subgrade soils. This was because the auger excavation was intended to start on the subgrade soils rather than granular materials which had variable thickness. The removal of granular material underneath the asphalt pavement exposed the subgrade soil at varying elevations of about one to three feet below the pavement level. The excavation of the auger-holes proceeded from the exposed subgrade level.

The asphalt material was properly disposed off-site along with other construction debris as described in Subsection 3.9.2.2. The subbase and granular material was stockpiled on-site for reuse as backfill during the pavement restoration at the completion of remedial work. This material was verified clean prior to backfill as part of the stockpile cleanup verification discussed in Subsection 3.7.3.

3.6.2 Excavation Procedure

Excavation was performed using a crane-mounted auger rig with 3-foot diameter auger attachments. Helical and bucket augers were used interchangeably as needed to provide maximum augering efficiency. Because of the auger wobbling during drilling, the hole excavated by either auger had a diameter of at least 3.5 feet. Overlapping of the auger-holes provided complete coverage of each excavation area.

The helical auger attachment was used at shallow depths where contaminated soil was not expected based on the exploratory data. The bucket auger was used in deeper soils where contamination was anticipated, and the soil moisture content was higher. The bucket auger was used to minimize soil scattering while unloading the bucket in transport vehicles. Each auger-hole was excavated from the ground surface to a depth of approximately 16 feet. This depth corresponds, approximately, to the top of ground water as indicated by the exploratory borings, monitoring wells, and/or the relatively high moisture content of the soils near the bottom of each excavation.

3.6.3 Excavation Sequence

The auger-holes were numbered as auger-holes 1 through 37 to keep track of excavation location, material and quantities. The numbering system was also used to relate field and laboratory analyses to the actual sampling location from any one of the auger-holes. However, these numbers do not reflect the sequence of drilling as the excavation sequence was based on a variety of factors including the following:

- Proximity of the auger-holes to the building foundation,
- Availability of aerated material for backfill,
- Availability of grout or imported soil for backfill,
- Setting time of grout backfill in the adjacent auger-hole, and
- Construction operational considerations.

3.6.4 Excavation Boundary Monitoring

3.6.4.1 Cleanup Confirmation Criteria

As proposed in the RDD, confirmation sampling to verify cleanup at the excavation boundaries required a minimum of three soil samples for field analyses and one sample for laboratory analysis per 50 square feet of the excavation walls (vertical sides at the perimeter of each excavation area). This sampling requirement was satisfied by the number of samples obtained, prior to the excavation, from the exploratory borings located at the perimeter of each excavation area as discussed below.

The exploratory borings were placed at a triangular grid spacing of 5.6 feet or less. At least two samples from each boring were analyzed in the laboratory and a minimum of six samples per boring were analyzed in the field. Each exploratory boring was about 16 feet deep, sampled at a vertical spacing of about 1.5 feet. Thus, each boring represents a vertical side with an area of 16 feet by 5.6 feet (90 square feet). Therefore, each boring provides one laboratory and three field analyses per 45 square feet of vertical cut along the perimeter of the excavation.

Based on the above discussion, the cleanup confirmation sampling criteria (one laboratory sample analysis and three field samples analyses per 50 square feet of excavation wall) are met by the exploratory borings. Therefore, no further analytical data would be required to verify the boundaries of the excavation as long as the excavation boundaries were extended to the exploratory borings already tested to be clean. However, additional analytical data (field and laboratory) were obtained during the excavation for further documentation of cleanup as discussed in the following Subsection.

3.6.4.2 Boundary Monitoring

Each auger-hole was monitored by using a portable photoionization detector (PID), HNU Model 101. The HNU readings were taken on the soil loads brought up by the auger from various depths inside the auger-hole. As proposed in the RDD (Volume II, Appendix 1, FSP), a conservative HNU reading of 5 ppm was used as the criterion for initially separating the "potentially clean soils" from "suspect soils".

These soils were later aerated or confirmed clean on the basis of the laboratory analyses as described in Subsection 3.7.3.

Additional monitoring was conducted for each auger-hole, especially those along the excavation boundaries to confirm cleanup. To measure the volatilized chemical concentrations inside the excavation space, HNU readings were taken in the breathing space immediately around the excavation (at the top of the auger-hole near the opening). When HNU readings in the immediate breathing space of an auger-hole were consistently elevated and chemical odor was persistent, the extent of excavation was enlarged by adding more auger-holes at the perimeter as discussed in Subsection 3.6.5. The HNU and Photovac readings recorded during the excavation are presented in Appendix B, Table B-2.

All but two auger-holes were excavated to a depth of about 16 feet below grade. Auger-holes 14 and 16 could not be advanced beyond 14 feet depth where a cemented layer was encountered above the water table. In these cases, a soil grab sample was obtained from a depth of 14 feet below grade. A grab sample was collected from the soil on the auger-hole as soon as the auger was brought up from a depth of 14 feet. Grab soil samples were collected from the auger by pushing a 2-inch diameter brass sampling sleeve into the soil on the auger. The soil samples were used for Photovac and laboratory analyses. The results of the laboratory and Photovac analyses are summarized in Table 19. The laboratory reports are presented in Appendix E. In all other auger-holes, grab soil samples were obtained for HNU and Photovac analyses on a routine basis. The results of these field analyses are presented in Appendix B, Table B-2.

3.6.5 Extent of the Actual Excavation Area

As a result of the cleanup monitoring discussed above, and only as a further precautionary measure, the extent of the planned excavation sites within Area 1 (Figure 11) was enlarged by augering additional auger-holes as shown in Figure 12. Twelve auger-holes (numbers 26 through 37) were added. These auger-holes were added where HNU readings in any of the perimeter auger-holes were consistently elevated and chemical odor was persistent. This was a conservative practice since the previous exploratory data had already delineated the excavation boundaries and the Photovac data in the auger-hole showed TCE concentrations below the cleanup standard (Table B2, Appendix B). The actual excavation boundaries in Area 1 are, therefore, as indicated in Figure 12.

The excavation boundary monitoring did not result in any modification to the planned excavation boundaries in Area 2. Therefore, the actual boundaries of excavation in Area 2 are the same as planned (Figure 10).

3.7 Soil Aeration

3.7.1 Soil Stockpiles

Each bucket or auger load of soil removed during excavation was screened with the HNU as described in Subsection 3.6.4.2. Soils yielding readings of 5 ppm or greater ("suspect soils") were sent to the temporary on-site stockpiles for aeration. Once a load of soil from a given hole was determined to be "suspect", all subsequent loads were automatically sent to the aeration stockpiles. These stockpiles were staged in the aeration pad area until a sufficient amount (approximately 30 cubic yards) of soil were accumulated for spreading over an aeration pad.

Soils which were not suspect were staged separately in temporary stockpiles and further sampled for Photovac analysis. Any soil confirmed "suspect", based on Photovac analysis (TCE > 0.15 mg/kg), was sent to the aeration stockpiles. This value of 0.15 mg/kg for Photovac was set as an arbitrary conservative value since all soils on the pads or in the stockpiles were to be confirmed clean on the basis of laboratory analyses. Stockpiles containing "potentially clean" soils, based on the Photovac analyses (TCE < 0.15 mg/kg), were periodically combined into a single large pile. Confirmation samples for laboratory analyses were then taken from the "potentially clean" stockpiles. Once the laboratory results confirmed that the soils in a stockpile met the cleanup standard, the stockpiled soils were made available for backfill in the excavations or for off-site disposal in a nonhazardous landfill.

Throughout the remediation, three stockpiles were confirmed clean on the basis of the laboratory samples. The size of each stockpile varied from about 25 to 40 cubic yards (loose volume). The laboratory samples were designated as CSB-3, CSP-4, and CSP-5 for stockpiles number 3, 4 and 5, respectively. The remaining stockpiles were aerated on the aeration pads. The results of analyses and the cleanup verification are discussed in Subsection 3.7.3.

3.7.2 Soil Aeration Pads

The aeration pads were located in the parking lot as shown in Figure 14. When sufficient soil was accumulated, it was spread in a single lift of 6-inch thickness (±2 inches) over a pad area. Each pad measured approximately 20 feet by 80 feet on plan dimensions. Pads 1 and 2 were spread and aerated concurrently. Pad 3 and 4 were also aerated together, Pad 5 was aerated last.

3.7.2.1 Aeration Cycles

The soil was aerated using a small tractor (Powershuttle 50E, MF) with a tiller attachment. Each pad was aerated for several cycles until laboratory results confirmed that the soil was clean. Each cycle consisted of 24 hours of aeration, with a minimum of 4-hour periodic tilling per day. The cycles were repeated as necessary. The dates and number of aeration cycles completed for each pad are as follows:

Aeration Pad Number	Dates Aerated	Number of Aeration Cycles
AP-1	12/9-12/11	3
AP-2	12/9-12/11	3
AP-3	12/11 - 12/13	3
AP-4	12/12 - 12/16	4
AP-5	12/13 - 12/16	3

Samples for Photovac analyses were taken periodically from each pad to track the progress of aeration. When the Photovac analyses from each pad indicated that the soils in the pad had achieved the TCE cleanup standard, confirmatory soil samples were obtained for laboratory analyses.

The sampling procedure consisted of dividing each aeration pad into six identical size rectangular units. One sample was taken from each unit by scraping off the upper 2 inches of soil and inserting a brass tube into the remaining soil layer. The brass tube was then prepared in the same fashion as described in Subsection 2.3.2 for soil samples taken during the exploratory drilling. The laboratory samples were tested for TCE and other parameters as discussed in Subsection 2.5.1. The results of

TCE analyses on samples from each pad (six samples per pad) were used to verify cleanup.

Throughout the remediation, soils from all the five pads were confirmed clean on the bases of the laboratory samples. The capacity of each aeration pad was approximately 30 cubic yards. The laboratory samples were designated as AP-1 through AP-5 for pads number 1 through 5 respectively. The results of analyses and the cleanup verification are discussed in the next subsection.

3.7.3 Cleanup Verification of Excavated Soils

Statistical analyses were performed on the laboratory results as outlined in the RDD (Volume II, Appendix 1, Field Sampling Plan). To verify cleanup, the mean concentration of TCE for each sampling event was to be at or below 0.3 mg/kg and the standard deviation was to be less than 0.15 mg/kg. The results of TCE analyses on all of the soil samples from each of the three stockpiles and five aeration pads were statistically evaluated. The evaluation indicated that the TCE levels were well below the cleanup standard as discussed below. The soils were, therefore, considered clean in all three stockpiles and five pads.

Eighteen soil samples were analyzed from three stockpiles (six samples per pile). Thirty soil samples were analyzed from the five aeration pads (six samples per pad). The mean TCE concentration of the soil samples from each stockpiles, and the maximum concentration detected, are presented in Table 20. The mean TCE concentration of the aerated soil samples for each pad, and the maximum concentration detected, are also listed in Table 20. As can be seen, all samples met the statistical criteria described above. A summary of TCE analytical data for individual soil samples from the clean stockpiles and aeration pads are presented in Tables 21 and 22, respectively. The statistical analysis presented in Table 20 is based on the laboratory data provided in Tables 21 and 22.

After the laboratory results passed the statistical criteria for TCE cleanup, the soils were made available for backfill in the excavation areas or for off-site disposal in a nonhazardous landfill. The remediation resulted in excavation of approximately 210 cubic yards of soil (in-situ volume). Approximately 145 cubic yards (loose volume) of the excavated soil was considered potentially contaminated. All of this soil was aerated to TCE levels below the cleanup standard based on the laboratory results as discussed above.

Ten percent of the soil samples from the clean stockpiles and aeration pads were also tested for parameters other than TCE as summarized in Tables 23 and 24, respectively. As discussed previously in Subsection 2.5.1, analyses for these parameters were made for documentation purposes only.

The laboratory analytical reports on the soil samples from the stockpiles and the aeration pads, along with the QA/QC data, and chain-of-custody documentation, are provided in Appendix E.

3.8 Backfilling

3.8.1 Material Type

Three types of materials were used to backfill the auger-holes:

- Grout
- Aerated soil
- Imported soil.

The choice of backfill was based on several factors relating to construction requirements. Grout was used where the auger holes were adjacent to the building foundation. Special grout (lean grout) with low strength and low cement content was used so that the backfill could be re-excavated if necessary. The purpose of the grout was to backfill the auger-hole as fast as possible with material having strength properties similar to, or somewhat higher than, the in-situ soils. These auger-holes had to be backfilled as soon as the excavation was complete in order to avoid caving. Placement of soil in these auger-holes would have required compaction and, therefore, more time than grout placement. In auger-holes not adjacent to the foundations, aerated soil from the excavation areas was used as backfill if available; otherwise, imported soil was placed in the auger-holes. No caving occurred throughout the entire remediation.

The soil type placed in the auger-holes was mainly silty clay or clayey silt, classified by the BEI on-site geologist as CL, or ML per the Unified Soil Classification System (ASTM D2488-84). This type of soil or grout were specified in the RDD to minimize the potential for creating vertical conduits to the ground water. The materials placed in the auger-holes were well mixed and contained no continuous lenses of sand or silt. Since such lenses are usually found in the natural substrata, the backfill material was considered better than the in-situ soils as far as vertical conduits are concerned.

3.8.2 Placement

Grout from a concrete batch plant in the City of Mountain View was delivered on site and placed in the designated auger-holes using the chute on the mix truck.

Soil material (aerated or imported) was placed in the auger-holes in 3-foot lifts. Each lift was compacted by means of a compaction plate welded on a long rod and hooked on to a backhoe. The backhoe tapped on each lift until the lift was packed firm. The top three feet of the backfill were placed in 1-foot lifts and each lift was compacted until field density tests indicated compaction at 95% or higher as compared to the maximum dry density obtained per ASTM D698-78. The last one-foot layer of backfill placed in each auger-hole consisted of granular subbase material which was covered later with 2 inches of asphalt. The original subbase material was used after the laboratory results of the stockpile indicated that the subbase was clean.

3.8.3 Quality Control

A resident BEI geologist classified the backfill material per ASTM D2488-84. Granular material types not meeting the specifications were segregated. The RDD specifications (Volume II, Appendix 3) called for SM, SC, ML, and CL types of soils classified per Unified Soil Classification System which is briefly described in Table 2. A sample of imported material was tested by an independent Laboratory and classified as CL. This sample represented the imported backfill placed in the auger-holes (approximately 72 cubic yards). The material was brought on site by the excavation contractor and placed in the laydown area as a single uniform stockpile.

The compaction tests on the subbase and the underlaying two feet of backfill soil were also performed by an independent laboratory, confirming that the 95% compaction requirement was met.

The backfill grout mix report and the quality control reports on the soil backfill (classification and compaction tests) are presented in Appendix F.

3.9 Waste Disposal

3.9.1 Hazardous Waste Disposal

Hazardous wastes were not accumulated during the remedial activities. However, the Cansorb unit that was dismantled during site preparation was conservatively assumed to be hazardous, as described in Subsection 3.5.2. The unit consisted of two 55-gallon drums containing carbon filters, which were wrapped in two layers of plastic liner and temporarily stored onsite until completion of remediation. The drums were protected against the elements, vandalism, accidental spill and unauthorized access.

Through a separate contract with NEC, EXEL TRANS of Benicia, CA (a licensed hazardous waste transporter) picked up the two drums of Cansorb Unit on January 31, 1992 and shipped them to the Cameron-Yakima Inc. recycling facility in Yakima, Washington for disposal by recycling the carbon units. The drums were labeled for transportation as required per 49 CFR Subchapter C and shipped under a Uniform Hazardous Waste Manifest as required by 40 CFR 262.20.

3.9.2 Non-hazardous Waste Disposal

Non-hazardous waste accumulated on site during remediation consisted of decontamination water, construction debris from site preparation, and aerated clean soils which were not used for backfill.

3.9.2.1 Disposal of Decontamination Water

During the remedial activities, wash and rinse water was accumulated from decontamination of equipment and personnel. Decontamination activities included steam cleaning, washing with phosphate-free detergent, and rinsing with the city tap water. The decontamination water was temporarily contained in an on-site, 6500-gallon, portable Poly tank.

Approximately, 2200 gallons of water were accumulated and stored during remediation. After sampling and analysis to verify that it met discharge requirements, the water was discharged at an on-site sewer inlet in accordance with an amendment to NEC's existing discharge permit from the City of Mountain View (Permit Number 490022). The water was sampled on December 20, 1991 and discharged on December 30, 1991. The laboratory report containing analytical data for the decontamination water is provided in Appendix G.

3.9.2.2 Disposal of Non-hazardous Solid Waste

Non-hazardous solid waste accumulated during remediation consisted of excess aerated clean soil and construction debris. Approximately 155 cubic yards (loose volume) of excess clean aerated soils (13 truck loads) which were not used for backfill were disposed off-site at the City of Mountain View Municipal Landfill on December 17.

In addition, one truck load (approximately 13 cubic yards, loose volume) of construction debris, consisting of broken pavement, site clearing and restoration debris and disposable personnel protective clothing (tyvec suits and gloves), was disposed of at the Mountain View landfill on December 31, 1991.

As part of the final site restoration, nine truck loads (approximately 110 cubic yards, loose volume) of gravel were also shipped to the Mountain View landfill on December 31, 1991. This gravel pile was removed from an area along the eastern edge of the site.

Decontamination of the asphalt pavement within the area of the five aeration pads was conducted on December 17, and December 30, 1991 by sweeping and pressure washing. The minimal wash water from the decontamination was swept and directed to the on-site sewer discharge point.

Restoration of the pavement that was removed for excavation was performed on December 16, 1991. The asphalt was delivered, placed, and compacted on the same day. The new asphalt was brought up to grade and matched with the old pavement in the adjacent areas. Approximately two inches of asphalt were laid out on the subbase over the entire excavation sites within Areas 1 and 2 (Figures 10 and 12).

Most of the equipment was demobilized soon after the excavation and backfill operations were complete. The asphalt placement equipment and the disposal trucks were demobilized after the site restoration was complete. The on-site laboratory equipment and the Poly tank were demobilized on December 30, 1991. The last truck load of non-hazardous debris left the site on December 31 and the truck was demobilized. Upon completion of all the remediation activities and demobilization of all the equipment, the rental fence surrounding the site was removed on January 3, 1992.

Section 4
Conclusions

Soil remediation at 501 Ellis Street was completed in December of 1991, in accordance with the EPA approved remedial design document (RDD) which was prepared in compliance with the requirements set forth in the §106 Administrative Order. The purpose of the soil remediation at the site was to satisfy the cleanup standard established by EPA in the *Record of Decision* and the *Explanation of Significant Differences* for the MEW Study Area.

During the remediation activities, thirty-six exploratory soil borings were drilled and sampled to further delineate the areas where previous data indicated TCE concentrations above 0.5 mg/kg within the unsaturated soils. Based on the results, approximately 210 cubic yards of soil were excavated from two areas within the paved area east of the 501 building. Soil remediation was not extended beneath the 501 building, considering the levels of TCE detected in soil samples from nine indoor exploratory borings.

The following conclusions summarize remediation activities performed at the site:

- The final exploration confirmed the locations of the hot spots identified by the previous investigations and expanded the overall size of one of the hot spots in Area 1.
- The volume of excavated material was within the range estimated in the RDD.
- The aeration techniques were successful in achieving the required cleanup standard established for TCE in soils (0.5 mg/kg).
- Perimeter air monitoring during remediation indicated no significant off-site release of VOC's to the air.
- The remediation activities were performed in accordance with appropriate health and safety requirements, and there were no health and safety incidents.
- The field and laboratory analyses were conducted in accordance with proper QA/QC procedures and the analytical data presented in this report are verified to be complete, precise and accurate.
- The boundaries of the excavations were confirmed to be clean of TCE on the basis of a triangular grid system of borings at 5.6-foot intervals. These

borings provide the confirmatory samples required for the verification of cleanup at the excavation boundaries as discussed in the RDD and required by Section IX.D.2f of the Order.

- No testing was required at the bottom of the excavation as the excavation was extended down to the ground water, at a depth of about 16 feet below grade. TCE cleanup below the ground water or evaluation of TCE concentrations within the saturated soil horizon were not within the scope of this work.

Section 5

References

Bechtel Environmental, Inc., July 1991, *Phase IV Soil Investigation, 501 Ellis Street Property, NEC Electronics Inc., Mountain View, California*

Bechtel Environmental, Inc. September 1991, *Proposed Final Remedial Design and Construction Operation and Maintenance Plan For 501 Ellis Street,Mountain View, California, Volumes I&II*

Bechtel Environmental, Inc., 1991, *NEC Electronics, Inc., Routine Ground-Water Monitoring Report, First Half 1991*

U.S. EPA, January 1990, *Laboratory Documentation Requirements for Data Validation,* 9QA-07-90.

U.S. EPA Region I Laboratory, June 1983, Clark, A. E.; Lataille, M. and E. L. Taylor, *The Use of a Portable PID Gas Chromatograph for Rapid Screening of Samples for Purgeable Organic Compounds in the Field and in the Laboratory.*

Table 1

SOIL SAMPLES IN UNSATURATED ZONE CONTAINING MORE THAN 0.5 mg/kg TCE
NEC, 501 Ellis Street, Mountain View, CA

Borings in Area 1	Date**	Sample Depth (feet)	Concentration (mg/kg)
BIV-006	9/20/90	8.5-9.0	0.53*
BIV-056	10/11/90	8.0-8.5	0.55
	10/11/90	8.5-9.0	0.84*
BIV-104	10/23/90	8.0-8.5	1.0*
	10/23/90	11.0-11.5	1.6*

Borings in Area 2	Date**	Sample Depth (feet)	Concentration (mg/kg)
SB-25	12/2/88	10.0-11.0	1.7

* Analyses by Photovac
** Note: Soil data summary after the underground units were removed in 1984

Table 2
BRIEF DESCRIPTION OF UNIFIED SOIL CLASSIFICATION SYSTEM(1)
NEC, 501 ELLIS STREET, MOUNTAIN VIEW, CA

Major Divisions	Group Symbol	Typical Names
Gravels		
Gravels	GW	Well-graded gravels and gravel-sand mixtures, little or no fines.
	GP	Poorly graded gravels and gravel-sand mixtures, little or no fines.
Gravels with Fines	GM	Silty gravels, gravel-sand-silt mixtures
	GC	Clayey gravels, gravel-sand-clay mixtures.
Sands		
Sands	SW	Well-graded sands and gravelly sands, little or no fines.
	SP	Poorly graded sands and gravelly sands, little or no fines.
Sands with Fines	SM	Silty sands, sand-silt mixture.
	SC	Clayey sands, sand-clay mixtures.
Silts and Clays	ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands.
	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
	OL	Organic silts and organic silty clays of low plasticity.
Silts and Clays	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts.
	CH	Inorganic clays of high plasticity, fat clays.
	OH	Organic clays of medium to high plasticity.
Highly Organic Soils	PT	Peat, muck, and other highly organic soils.

(1) ASTM D2487 or D2488-84

Table 3

CHEMICALS OF CONCERN AND ANALYTICAL METHODS
FOR SOIL SAMPLES
NEC, 501 ELLIS STREET, MOUNTAIN VIEW, CA

ANALYTE	EPA ANALYTICAL METHOD[1]	DETECTION LIMIT (mg/kg)
Chloroform	Method 8010	0.005
1,2-Dichlorobenzene	Method 8020	0.005
Toluene	Method 8020	0.005
1,1-Dichloroethane	Method 8010	0.005
1,1-Dichloroethene	Method 8010	0.005
1,2-Dichloroethene	Method 8010	0.005
Freon 113[2]	Method 8010	0.005
Phenol	Method 8040	0.1
Tetrachloroethane	Method 8010	0.005
Trichlorobenzene (TCB)[3]	Method 8010	0.01
1,1,1-Trichloroethane	Method 8010	0.005
Trichloroethene[4]	Method 8010	0.005
Vinyl Chloride	Method 8010	0.01
Antimony	Method 6010	5.0
Arsenic	Method 7060	0.25
Cadmium	Method 6010	0.5
Lead	Method 7421	0.25

Notes:
1. All sampling and analytical procedures are to be performed in accordance with EPA SW-846
2. Freon 113 is not a standard analyte for Method 8010, but it is to be measured and reported upon request.
3. Although TCB is not routinely reported, it is normally measured; TCB is to be reported upon request.
4. Indicator parameter.

TABLE 4

COMPARISON OF LABORATORY QUALITY CONTROL RESULTS WITH PROJECT DATA QUALITY OBJECTIVES
NEC, 501 Ellis Street, Mountain View, CA

Parameter	Method	Accuracy (a)		Precision (b)		Completeness (c)	
		Average	Project Goal	Average	Project Goal	Average	Project Goal
Halogenated Volatile Organics	EPA 8010	96%	60-140%	11%	<45%	99%	>90%
Aromatic Volatile Organics	EPA 8020	104%	60-140%	1.6%	<45%	98%	>90%
Phenol	EPA 8040	55%	26-90%	18%	<35%	98%	>90%
Heavy Metals	EPA 6010, 7060 7421	104%	75-125%	2.8%	<20%	98%	>90%

(a) Percent Recovery.

(b) Maximum relative percent difference (RPD) at ten times the limit of detection.

(c) The percent of data obtained with respect to the project data objectives.

TABLE 5

STATISTICAL EVALUATION OF PHOTOVAC ANALYSIS FOR TCE IN SOIL SAMPLES FROM BORINGS INSIDE THE 501 BUILDING

NEC, 501 Ellis Street, Mountain View, CA

BORING NUMBER	R-1	R-2	R-3	R-5	R-6	R-7	R-10	R-11	R-12	TOTAL
Number of Samples	5	5	5	5	5	5	5	5	5	45
Minimum Concentration *	0.12	0.05	0.06	0.11	0.15	0.19	0.04	0.02	0.14	0.02
Maximum Concentration *	1.1	0.09	0.19	0.23	1.2	2.1	0.34	0.28	0.68	2.1
Concentration Range *	0.98	0.03	0.13	0.12	1.1	1.9	0.30	0.26	0.54	2.1
Mean TCE Concentration *	0.60	0.07	0.09	0.18	0.70	1.1	0.20	0.12	0.35	0.38
Standard Deviation	0.45	0.01	0.06	0.05	0.41	0.74	0.13	0.10	0.20	0.45

* TCE concentrations are given in mg/kg

TABLE 6
PHOTOVAC RESULTS FOR TCE IN SOIL SAMPLES FROM BORINGS INSIDE 501 BUILDING
NEC, 501 Ellis Street, Mountain View, CA

Indoor Boring	Depth (feet)	TCE Concentration (mg/kg)
R-1	3.5	0.12
R-1	6.5	0.56
R-1	9.5	1.0
R-1	12.5	0.21
R-1	15.5	1.1
R-2	3.5	0.060
R-2	6.5	0.069
R-2	9.5	0.059
R-2	12.5	0.054
R-2	15.5	0.088
R-3	3.5	0.060
R-3	6.5	0.070
R-3	9.5	0.057
R-3	12.5	0.058
R-3	15.5	0.190
R-5	3.5	0.110
R-5	6.5	0.230
R-5	9.5	0.230
R-5	12.5	0.180
R-5	15.5	0.170
R-7	3.5	0.19
R-7	6.5	1.30
R-7	9.5	1.40
R-7	12.5	0.59
R-7	15.5	2.1
R-10	3.0	0.039
R-10	6.5	0.25
R-10	9.5	0.089
R-10	12.5	0.29
R-10	15.5	0.34
R-11	3.5	0.12
R-11	6.5	0.13
R-11	9.5	0.047
R-11	12.5	0.017
R-11	15.5	0.28
R-12	3.5	0.14
R-12	6.5	0.25
R-12	9.5	0.31
R-12	12.5	0.68
R-12	15.5	0.37

TABLE 7

STATISTICAL EVALUATION OF LABORATORY ANALYSIS FOR TCE IN SOIL SAMPLES FROM BORINGS INSIDE THE 501 BUILDING

NEC, 501 Ellis Street, Mountain View, CA

BORING NUMBER	R-1	R-2	R-3	R-5	R-6	R-7	R-10	R-11	R-12	TOTAL
Number of Samples	4	4	4	4	3	4	5	4	4	36
Minimum Concentration (mg/kg)	0.079	0.008	0.003(a)	0.012	0.23	0.22	0.007	0.006	0.014	0.025(a)
Maximum Concentration (mg/kg)	0.33	0.019	0.068	0.058	0.55	0.37	0.067	0.020	0.25(b)	0.55
Concentration Range (mg/kg)	0.25	0.011	0.065	0.046	0.32	0.150	0.060	0.014	0.24	0.55
Mean TCE Concentration	0.19	0.014	0.022	0.037	0.36	0.29	0.032	0.013	0.084	0.11
Standard Deviation	0.11	0.005	0.031	0.023	0.170	0.064	0.026	0.008	0.11	0.14

(a) - One sample was non-detectable for TCE at 0.005 mg/kg; a value of half (0.0025 mg/kg) was used for statistical calculation.

(b) - One sample was non-detectable for TCE at a detection limit of 0.5 mg/kg; a value of 0.25 mg/kg was used for statistical calculation.

TABLE 8

LABORATORY RESULTS FOR TCE IN SOIL SAMPLES

FROM BORINGS INSIDE 501 BUILDING

NEC, 501 Ellis Street, Mountain View, CA

Indoor Boring	Sample ID	Depth (feet)	TCE Concentration (mg/kg)
R-1	R-1-6.0-6.5	6.0 - 6.5	0.12
R-1	R-1-9.0-9.5	9.0 - 9.5	0.33
R-1	R-1-12.0-12.5	12.0 - 12.5	0.079
R-1	R-1-15.0-15.5	15.0 - 15.5	0.22
R-2	R-2-6.0-6.5	6.0 - 6.5	0.008
R-2	R-2-9.0-9.5	9.0 - 9.5	0.01
R-2	R-2-12.0-12.5	12.0 - 12.5	0.017
R-2	R-2-15.0-15.5	15.0 - 15.5	0.019
R-3	R-3-6.0-6.5	6.0 - 6.5	<0.005
R-3	R-3-9.0-9.5	9.0 - 9.5	0.006
R-3	R-3-12.0-12.5	12.0 - 12.5	0.012
R-3	R-3-15.0-15.5	15.0 - 15.5	0.068
R-5	R-5-3.0-3.5	3.0 - 3.5	0.056
R-5	R-5-6.0-6.5	6.0 - 6.5	0.012
R-5	R-5-9.0-9.5	9.0 - 9.5	0.023
R-5	R-5-12.0-12.5	12.0 - 12.5	0.058
R-6	R-6-6.0-6.5	6.0 - 6.5	0.29
R-6	R-6-9.0-9.5	9.0 - 9.5	0.23
R-6	R-6-12.0-12.5	12.0 - 12.5	0.55
R-7	R-7-6.0-6.5	6.0 - 6.5	0.29
R-7	R-7-9.0-9.5	9.0 - 9.5	0.26
R-7	R-7-12.0-12.5	12.0 - 12.5	0.22
R-7	R-7-15.0-15.5	15.0 - 15.5	0.37
R-10	R-10-2.5-3.0	2.5 - 3.0	0.007
R-10	R-10-6.0-6.5	6.0 - 6.5	0.025
R-10	R-10-9.0-9.5	9.0 - 9.5	0.012
R-10	R-10-12.0-12.5	12.0 - 12.5	0.067
R-10	R-10-15.0-15.5	15.0 - 15.5	<0.10
R-11	R-11-3.0-3.5	3.0 - 3.5	0.020
R-11	R-11-6.0-6.5	6.0 - 6.5	0.008
R-11	R-11-12.0-12.5	12.0 - 12.5	0.006
R-11	R-11-15.0-15.5	15.0 - 15.5	0.020
R-12	R-12-3.0-3.5	3.0 - 3.5	0.014
R-12	R-12-6.0-6.5	6.0 - 6.5	0.049
R-12	R-12-9.0-9.5	9.0 - 9.5	0.023
R-12	R-12-12.0-12.5	12.0 - 12.5	<0.50

TABLE 9

LABORATORY RESULTS FOR CHEMICALS OF CONCERN IN SOIL SAMPLES
FROM BORINGS INSIDE 501 BUILDING
NEC, 501 Ellis Street, Mountain View, CA
(Sheet 1 of 2)

Indoor Boring No.: Sample ID: Depth (feet): Concentration Units:	R-1 R-1-9.0-9.5 9.0 - 9.5 mg/kg	R-7 R-7-9.0-9.5 9.0 - 9.5 mg/kg	R-10 R-10-12.0-12.5 12.0 - 12.5 mg/kg	R-10 R-10-15.0-15.5 15.0 - 15.5 mg/kg	R-11 R-11-6.0-6.5 6.0 - 6.5 mg/kg	R-12 R-12-9.0-9.5 9.0 - 9.5 mg/kg	R-12 R-12-12.0-12.5 12.0 - 12.5 mg/kg
METHOD 8010							
Analyte							
Bromodichloromethane	<0.005	<0.005	<0.050	<0.10	<0.005	<0.005	<0.50
Bromoform	<0.010	<0.010	<0.10	<0.20	<0.010	<0.010	<1.0
Bromomethane	<0.010	<0.010	<0.10	<0.20	<0.010	<0.010	<1.0
Carbon tetrachloride	<0.005	<0.005	<0.050	<0.10	<0.005	<0.005	<0.50
Chlorobenzene	<0.005	<0.005	<0.050	<0.10	<0.005	<0.005	<0.50
Chloroethane	<0.010	<0.010	<0.10	<0.20	<0.010	<0.010	<1.0
2-Chloroethylvinyl ether	<0.010	<0.010	<0.10	<0.20	<0.010	<0.010	<1.0
Chloroform	<0.005	<0.005	<0.050	<0.10	<0.005	<0.005	<0.50
Chloromethane	<0.010	<0.010	<0.10	<0.20	<0.010	<0.010	<1.0
Dibromochloromethane	<0.005	<0.005	<0.050	<0.10	<0.005	<0.005	<0.50
1,2-Dichlorobenzene	<0.005	<0.005	0.21	<0.10	<0.005	<0.005	<0.50
1,3-Dichlorobenzene	<0.005	<0.005	<0.050	<0.10	<0.005	<0.005	<0.50
1,4-Dichlorobenzene	<0.005	<0.005	<0.050	<0.10	<0.005	<0.005	<0.50
1,1-Dichloroethane	<0.005	<0.005	<0.050	<0.10	<0.005	<0.005	<0.50
1,2-Dichloroethane	<0.005	<0.005	<0.050	<0.10	<0.005	<0.005	<0.50
1,1-Dichloroethene	<0.005	<0.005	<0.050	<0.10	<0.005	<0.005	<0.50
cis-1,2-Dichloroethene	<0.005	<0.005	<0.050	<0.10	<0.005	<0.005	<0.50
trans-1,2-Dichloroethene	<0.005	<0.005	<0.050	<0.10	<0.005	<0.005	<0.50
1,2-Dichloropropane	<0.005	<0.005	<0.050	<0.10	<0.005	<0.005	<0.50
cis-1,3-Dichloropropene	<0.010	<0.010	<0.10	<0.20	<0.010	<0.010	<1.0
trans-1,3-Dichloropropene	<0.010	<0.010	<0.10	<0.20	<0.010	<0.010	<1.0
Methylene chloride	<0.020	<0.020	<0.20	<0.40	<0.020	<0.020	<2.0
1,1,2,2-Tetrachloroethane	<0.005	<0.005	<0.050	<0.10	<0.005	<0.005	<0.50
Tetrachloroethene	<0.005	0.024	<0.050	<0.10	<0.005	<0.005	<0.50
1,1,1-Trichloroethane	<0.005	<0.005	<0.050	<0.10	<0.005	<0.005	<0.50
1,1,2-Trichloroethane	<0.005	<0.005	<0.050	<0.10	<0.005	<0.005	<0.50
Trichloroethene	0.330	0.260	0.067	<0.10	0.008	0.023	<0.50
Trichlorofluoromethane	<0.010	<0.010	<0.10	<0.20	<0.010	<0.010	<1.0
Vinyl chloride	<0.010	<0.010	<0.10	<0.20	<0.010	<0.010	<1.0
1,2,4-Trichlorobenzene	<0.005	NA	NA	0.10	<0.005	<0.005	3.9
Freon 113	0.009	NA	NA	0.26	<0.005	<0.005	<0.50

NA = Not Analyzed

TABLE 9

LABORATORY RESULTS FOR CHEMICALS OF CONCERN IN SOIL SAMPLES
FROM BORINGS INSIDE 501 BUILDING
NEC, 501 Ellis Street, Mountain View, CA
(Sheet 2 of 2)

Indoor Boring No.: Sample ID: Depth (feet): Concentration Units:	R-1 R-1-9.0-9.5 9.0 - 9.5 mg/kg	R-7 R-7-9.0-9.5 9.0 - 9.5 mg/kg	R-10 R-10-12.0-12.5 12.0 - 12.5 mg/kg	R-10 R-10-15.0-15.5 15.0 - 15.5 mg/kg	R-11 R-11-6.0-6.5 6.0 - 6.5 mg/kg	R-12 R-12-9.0-9.5 9.0 - 9.5 mg/kg	R-12 R-12-12.0-12.5 12.0 - 12.5 mg/kg
METHOD 8020 Analyte							
Benzene	<0.005	<0.005	<0.050	<0.10	<0.005	<0.005	<0.50
Chlorobenzene	<0.005	<0.005	<0.050	<0.10	<0.005	<0.005	<0.50
1,4-Dichlorobenzene	<0.005	<0.005	<0.050	<0.10	<0.005	<0.005	<0.50
1,3-Dichlorobenzene	<0.005	<0.005	<0.050	<0.10	<0.005	<0.005	<0.50
1,2-Dichlorobenzene	<0.005	<0.005	<0.050	<0.10	<0.005	<0.005	<0.50
Ethyl Benzene	<0.005	<0.005	1.5	<0.10	<0.005	0.008	<0.50
Toluene	0.006	<0.005	<0.050	<0.10	<0.005	<0.005	<0.50
Xylene	<0.005	<0.005	1.3	<0.10	<0.005	0.009	<0.50
METHOD 8040 Analyte							
4-Chloro-3-methylphenol	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
2-Chlorophenol	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
2,4-Dichlorophenol	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
2,4-Dimethylphenol	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
2,4-Dinitrophenol	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
2-Methyl-4,6-dinitrophenol	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
2-Nitrophenol	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
4-Nitrophenol	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Pentachlorophenol	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Phenol	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
2,4,6-Trichlorophenol	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
METALS Analyte							
Antimony	110	89	88	130	160	110	130
Cadmium	<0.50	<0.50	<0.50	<0.50	0.51	<0.50	<0.50
Lead	<5.0	<5.0	<5.0	6.3	8.6	<5.0	<5.0
Arsenic	21	<5.0	18	14	25	<5.0	5.1

NA = Not Analyzed

TABLE 10

PHOTOVAC RESULTS FOR TCE IN SOIL SAMPLES FROM BORINGS, AREA 1 - OUTDOORS
NEC, 501 Ellis Street, Mountain View, CA

Exploratory Boring	Depth (feet)	TCE Concentration (mg/kg)
R-4	3.5	0.053
R-4	6.5	0.049
R-4	9.5	0.086
R-4	12.5	0.11
R-4	15.5	0.087
R-8	3.5	0.021
R-8	6.5	0.017
R-8	9.5	0.038
R-8	12.5	0.042
R-8	15.5	0.13
R-9	3.5	0.004
R-9	6.5	0.14
R-9	9.5	1.5
R-9	12.5	2.2
R-9	15.5	0.56
R-27	2.5	0.043
R-27	6.5	0.045
R-27	9.0	0.045
R-27	12.0	0.044
R-27	15.5	0.13
R-28	3.0	0.059
R-28	6.5	0.093
R-28	9.5	0.070
R-28	12.5	0.039
R-28	15.5	0.25
R-29	3.0	0.049
R-29	6.0	0.15
R-29	8.5	0.16
R-29	12.5	0.095
R-29	15.5	0.10
R-30	3.0	0.11
R-30	6.0	0.13
R-30	9.0	0.10
R-30	12.0	0.063
R-30	15.5	0.13

Exploratory Boring	Depth (feet)	TCE Concentration (mg/kg)
R-31	3.5	0.081
R-31	5.5	0.062
R-31	8.5	0.094
R-31	12.5	0.036
R-31	15.5	0.14
R-32	3.0	0.085
R-32	5.5	0.071
R-32	9.0	0.074
R-32	12.0	0.015
R-32	15.0	0.15
R-33	3.0	0.005
R-33	6.0	0.11
R-33	12.5	0.11
R-33	16.0	0.43
R-34	3.5	<0.005
R-34	6.5	0.19
R-34	9.0	0.16
R-34	12.5	0.059
R-34	15.5	0.13
R-35	6.5	0.12
R-35	9.0	1.50
R-35	12.5	1.10
R-35	15.5	1.00
R-36	3.0	0.083
R-36	6.5	0.20
R-36	9.0	0.25
R-36	12.5	0.39
R-36	15.5	0.066

TABLE 11
PHOTOVAC RESULTS FOR TCE IN SOIL SAMPLES FROM BORINGS, AREA 2
NEC, 501 Ellis Street, Mountain View, CA

Exploratory Boring	Depth (feet)	TCE (mg/kg)	Exploratory Boring	Depth (feet)	TCE(mg/kg)
R-13	3.5	0.094	R-20	3.0	0.072
R-13	6.5	0.094	R-20	6.0	0.040
R-13	9.5	0.079	R-20	9.0	0.029
R-13	12.0	0.052	R-20	12.5	0.028
R-13	15.5	0.37	R-20	15.5	0.084
R-14	2.5	0.047	R-21	2.5	0.031
R-14	5.5	0.052	R-21	5.5	0.026
R-14	9.5	0.044	R-21	8.5	0.026
R-14	11.5	0.042	R-21	12.0	0.019
R-14	15.5	0.18	R-21	15.5	0.039
R-15	2.5	0.042	R-22	2.5	0.004
R-15	5.5	0.045	R-22	6.0	0.025
R-15	9.0	0.063	R-22	9.0	0.013
R-15	11.5	0.051	R-22	12.0	0.029
R-15	15.0	0.080	R-22	15.5	0.011
R-16	3.0	0.075	R-23	2.5	0.023
R-16	6.0	0.072	R-23	6.5	0.058
R-16	8.5	0.084	R-23	9.0	0.040
R-16	12.0	0.088	R-23	12.0	0.025
R-16	15.0	0.11	R-23	15.5	0.11
R-17	2.5	0.035	R-24	2.5	0.022
R-17	6.0	0.029	R-24	6.0	0.029
R-17	9.0	0.026	R-24	9.0	0.016
R-17	11.5	0.057	R-24	12.0	0.018
R-17	15.5	0.068	R-24	15.5	0.018
R-18	2.5	0.047	R-25	3.0	0.029
R-18	6.5	0.042	R-25	5.5	0.024
R-18	9.0	0.034	R-25	9.0	0.025
R-18	12.0	0.023	R-25	12.0	0.047
R-18	15.5	0.045	R-25	15.5	0.024
R-19	2.5	0.039	R-26	3.0	0.050
R-19	6.0	0.063	R-26	5.5	0.021
R-19	9.0	0.034	R-26	8.5	0.015
R-19	12.0	0.037	R-26	12.5	0.027
R-19	15.5	0.076	R-26	15.0	0.022

TABLE 12

LABORATORY RESULTS FOR TCE IN SOIL SAMPLES
FROM BORINGS, AREA 1 - OUTDOORS
NEC, 501 Ellis Street, Mountain View, CA

Exploratory Boring	Sample ID	Depth (feet)	TCE Concentration (mg/kg)
R-4	R-4-9.0-9.5	9.0 - 9.5	0.022
R-4	R-4-12.0-12.5	12.0 - 12.5	<0.025
R-8	R-8-9.0-9.5	9.0 - 9.5	0.015
R-8	R-8-12.0-12.5	12.0 - 12.5	0.014
R-9	R-9-9.0-9.5	9.0 - 9.5	4.1
R-9	R-9-12.0-12.5	12.0 - 12.5	0.65
R-27	R-27-6.0-6.5	6.0 - 6.5	0.005
R-27	R-27-11.5-12.0	11.5 - 12.0	0.006
R-28	R-28-6.0-6.5	6.0 - 6.5	0.011
R-28	R-28-12.0-12.5	12.0 - 12.5	0.006
R-29	R-29-5.5-6.0	5.5 - 6.0	0.025
R-29	R-29-8.5-9.0	8.5 - 9.0	<0.005
R-30	R-30-6.0-6.5	6.0 - 6.5	0.052
R-30	R-30-12.0-12.5	12.0 - 12.5	0.045
R-31	R-31-8.5-9.0	8.5 - 9.0	0.008
R-31	R-31-12.0-12.5	12.0 - 12.5	0.007
R-32	R-32-3.0-3.5	3.0 - 3.5	0.008
R-32	R-32-8.5-9.0	8.5 - 9.0	0.008
R-33	R-33-12.0-12.5	12.0 - 12.5	0.024
R-33	R-33-15.5-16.0	15.5 - 16.0	0.10
R-34	R-34-6.0-6.5	6.0 - 6.5	0.12
R-34	R-34-9.0-9.5	9.0 - 9.5	0.006
R-35	R-35-8.5-9.0	8.5 - 9.0	0.51
R-35	R-35-12.0-12.5	12.0 - 12.5	0.19
R-35	R-35-15.0-15.5	15.0 - 15.5	0.56
R-36	R-36-9.0-9.5	9.0 - 9.5	0.037
R-36	R-36-12.0-12.5	12.0 - 12.5	0.085

TABLE 13

LABORATORY RESULTS FOR TCE IN SOIL SAMPLES FROM BORINGS, AREA 2

NEC, 501 Ellis Street, Mountain View, CA

Exploratory Boring	Sample ID	Depth (feet)	TCE Concentration (mg/kg)
R-13	R-13-3.0-3.5	3.0 - 3.5	0.015
R-13	RA-13-6.0-6.5	6.0 - 6.5	0.005
R-14	R-14-5.5-6.0	5.5 - 6.0	<0.005
R-14	R-14-11.5-12.0	11.5 - 12.0	<0.005
R-15	R-15-9.0-9.5	9.0 - 9.5	<0.005
R-15	R-15-11.5-12.0	11.5 - 12.0	<0.005
R-16	R-16-6.0-6.5	6.0 - 6.5	<0.005
R-16	R-16-12.0-12.5	12.0 - 12.5	<0.005
R-17	R-17-6.0-6.5	6.0 - 6.5	0.009
R-17	R-17-11.5-12.0	11.5 - 12.0	0.005
R-18	R-18-2.5-3.0	2.5 - 3.0	0.006
R-18	R-18-9.0-9.5	9.0 - 9.5	<0.005
R-19	R-19-6.0-6.5	6.0 - 6.5	0.011
R-19	R-19-12.0-12.5	12.0 - 12.5	0.007
R-20	R-20-3.0-3.5	3.0 - 3.5	0.058
R-20	R-20-12.5-13.0	12.5 - 13.0	0.009
R-21	R-21-5.5-6.0	5.5 - 6.0	<0.005
R-21	R-21-12.0-12.5	12.0 - 12.5	0.023
R-22	R-22-6.0-6.5	6.0 - 6.5	0.009
R-22	R-22-12.0-12.5	12.0 - 12.5	0.008
R-23	R-23-6.0-6.5	6.0 - 6.5	0.009
R-23	R-23-9.0-9.5	9.0 - 9.5	0.006
R-24	R-24-6.0-6.5	6.0 - 6.5	0.006
R-24	R-24-12.0-12.5	12.0 - 12.5	0.018
R-25	R-25-3.0-3.5	3.0 - 3.5	0.021
R-25	R-25-12.0-12.5	12.0 - 12.5	0.005
R-26	R-26-3.0-3.5	3.0 - 3.5	0.021
R-26	R-26-12.0-12.5	12.0 - 12.5	0.008

TABLE 14

LABORATORY RESULTS FOR CHEMICALS OF CONCERN IN SOIL SAMPLES FROM BORINGS, AREA 1-OUTDOORS
NEC, 501 Ellis Street, Mountain View, CA

Exploratory Boring No.:	R-29	R-34
Sample ID:	R-29-8.5-9.0	R-34-6.0-6.5
Depth (feet):	8.5 - 9.0	6.0 - 6.5
Concentration Units:	(mg/kg)	(mg/kg)
METHOD 8010 Analyte		
Bromodichloromethane	<0.005	<0.050
Bromoform	<0.010	<0.10
Bromomethane	<0.010	<0.10
Carbon tetrachloride	<0.005	<0.050
Chlorobenzene	<0.005	<0.050
Chloroethane	<0.010	<0.10
2-Chloroethylvinyl ether	<0.010	<0.10
Chloroform	<0.005	<0.050
Chloromethane	<0.010	<0.10
Dibromochloromethane	<0.005	<0.050
1,2-Dichlorobenzene	<0.005	<0.050
1,3-Dichlorobenzene	<0.005	<0.050
1,4-Dichlorobenzene	<0.005	<0.050
1,1-Dichloroethane	<0.005	<0.050
1,2-Dichloroethane	<0.005	<0.050
1,1-Dichloroethene	<0.005	<0.050
cis-1,2-Dichloroethene	<0.005	<0.050
trans-1,2-Dichloroethene	<0.005	<0.050
1,2-Dichloropropane	<0.005	<0.050
cis-1,3-Dichloropropene	<0.010	<0.10
trans-1,3-Dichloropropene	<0.010	<0.10
Methylene chloride	<0.020	<0.20
1,1,2,2-Tetrachloroethane	<0.005	<0.050
Tetrachloroethene	<0.005	<0.050
1,1,1-Trichloroethane	<0.005	<0.050
1,1,2-Trichloroethane	<0.005	<0.050
Trichloroethene	<0.005	0.12
Trichlorofluoromethane	<0.010	<0.10
Vinyl chloride	0.018	<0.10
1,2,4-Trichlorobenzene	0.024	0.18
Freon 113	0.007	1.5

Exploratory Boring No.:	R-29	R-34
Sample ID:	R-29-8.5-9.0	R-34-6.0-6.5
Depth (feet):	8.5 - 9.0	6.0 - 6.5
Concentration Units:	(mg/kg)	(mg/kg)
METHOD 8020 Analyte		
Benzene	<0.005	<0.050
Chlorobenzene	<0.005	<0.050
1,4-Dichlorobenzene	<0.005	<0.050
1,3-Dichlorobenzene	<0.005	<0.050
1,2-Dichlorobenzene	<0.005	<0.050
Ethyl Benzene	<0.005	<0.050
Toluene	<0.005	0.082
Xylene	<0.005	<0.050
METHOD 8040 Analyte		
4-Chloro-3-methylphenol	<0.10	<5.0
2-Chlorophenol	<0.10	<5.0
2,4-Dichlorophenol	<0.10	<5.0
2,4-Dimethylphenol	<0.10	<5.0
2,4-Dinitrophenol	<0.50	<25.0
2-Methyl-4,6-dinitrophenol	<0.50	<25.0
2-Nitrophenol	<0.10	<5.0
4-Nitrophenol	<0.10	<5.0
Pentachlorophenol	<0.50	<25.0
Phenol	<0.10	<5.0
2,4,6-Trichlorophenol	<0.10	<5.0
METALS Analytes		
Antimony	98	150
Cadmium	0.52	<0.50
Lead	<5.0	<5.0
Arsenic	<5.0	<5.0

TABLE 15

LABORATORY RESULTS FOR CHEMICALS OF CONCERN IN SOIL SAMPLES FROM BORINGS, AREA 2

NEC, 501 Ellis Street, Mountain View, CA

Exploratory Boring No.: Sample ID: Depth (feet): Concentration Units:	R-23 R-23-6.0-6.5 6.0 - 6.5 (mg/kg)
METHOD 8010 Analyte	
Bromodichloromethane	<0.005
Bromoform	<0.010
Bromomethane	<0.010
Carbon tetrachloride	<0.005
Chlorobenzene	<0.005
Chloroethane	<0.010
2-Chloroethylvinyl ether	<0.010
Chloroform	<0.005
Chloromethane	<0.010
Dibromochloromethane	<0.005
1,2-Dichlorobenzene	<0.005
1,3-Dichlorobenzene	<0.005
1,4-Dichlorobenzene	<0.005
1,1-Dichloroethane	<0.005
1,2-Dichloroethane	<0.005
1,1-Dichloroethene	<0.005
cis-1,2-Dichloroethene	<0.005
trans-1,2-Dichloroethene	<0.005
1,2-Dichloropropane	<0.005
cis-1,3-Dichloropropene	<0.010
trans-1,3-Dichloropropene	<0.010
Methylene chloride	<0.020
1,1,2,2-Tetrachloroethane	<0.005
Tetrachloroethene	<0.005
1,1,1-Trichloroethane	<0.005
1,1,2-Trichloroethane	<0.005
Trichloroethene	0.009
Trichlorofluoromethane	<0.010
Vinyl chloride	<0.010
1,2,4-Trichlorobenzene	<0.005
Freon 113	<0.005

Exploratory Boring No.: Sample ID: Depth (feet): Concentration Units:	R-23 R-23-6.0-6.5 6.0 - 6.5 (mg/kg)
METHOD 8020 Analyte	
Benzene	<0.005
Chlorobenzene	<0.005
1,4-Dichlorobenzene	<0.005
1,3-Dichlorobenzene	<0.005
1,2-Dichlorobenzene	<0.005
Ethyl Benzene	<0.005
Toluene	0.007
Xylene	<0.005
METHOD 8040 Analyte	
4-Chloro-3-methylphenol	<0.10
2-Chlorophenol	<0.10
2,4-Dichlorophenol	<0.10
2,4-Dimethylphenol	<0.10
2,4-Dinitrophenol	<0.50
2-Methyl-4,6-dinitrophenol	<0.50
2-Nitrophenol	<0.10
4-Nitrophenol	<0.10
Pentachlorophenol	<0.50
Phenol	<0.10
2,4,6-Trichlorophenol	<0.10
METALS Analytes	
Antimony	120
Cadmium	<0.5
Lead	6.8
Arsenic	8.2

TABLE 16

LABORATORY RESULTS ON AIR SAMPLES
FOR PERIMETER BACKGROUND MONITORING - (SAMPLED ON 11/12/1991)
NEC, 501 Ellis Street, Mountain View, CA

Sample Identification	3351	3822	9606	3007	8090	TWA (mg/m^3)
<u>Lab Results (ng/L)</u>						
1,1,1, Trichloroethane	0.024	0.052	0.18	0.16	0.15	NA
Benzene	0.038	0.045	0.15	0.16	0.083	NA
Toluene	0.077	0.11	0.29	0.37	0.19	NA
<u>Conversion (mg/m^3)</u>						
1,1,1 Trichloroethane	0.000024	0.000052	0.00018	0.00016	0.00015	1900
Benzene	0.000038	0.000045	0.00015	0.00016	0.00083	1
Toluene	0.000077	0.00011	0.00029	0.00037	0.00019	375

NA = Not Applicable

TABLE 17

LABORATORY RESULTS ON AIR SAMPLES
FOR PERIMETER MONITORING - (Sampled on 12/6/1991)
NEC, 501 Ellis Street, Mountain View, CA

Sample Identification	3351	3822	9606	3007	8090	TWA (mg/m3)
Lab Results (ng/L)						
1,1,1 Trichloroethane	0.71	5.1	4.0	2.8	4.9	NA
Benzene	ND	10	4.2	7.3	16	NA
Toluene	2.0	23	11	16	33	NA
Trichloroethene	ND	ND	0.82	0.6	0.77	NA
Conversion (mg/m3)						
1,1,1 Trichloroethane	0.00071	0.0051	0.004	0.0028	0.0049	1900
Benzene	ND	0.01	0.0042	0.0073	0.016	1
Toluene	0.002	0.023	0.011	0.016	0.033	375
Trichloroethene	ND	ND	0.00082	0.0006	0.00077	270

ND- Not Detected; detection limit based on total ng (ND <10 ng).
NA- Not Applicable

TABLE 18

LABORATORY RESULTS ON AIR SAMPLES
FOR PERIMETER MONITORING - (Sampled on 12/10/1991)
NEC, 501 Ellis Street, Mountain View, CA

Sample Identification	8090	3822	9606	3007	NIOSH TWA (mg/m3)
Lab Results (ng/L)					
1,1,1 Trichloroethane	3.0	9.6	13	3.3	NA
Benzene	3.6	3.4	7.1	2.6	NA
Toluene	8.4	7.0	35	7.5	NA
Trichloroethene	0.51	ND <10	0.68	ND<10	NA
Methylene Chloride	ND <100	ND <100	ND <100	19	NA
Conversion (mg/m3)					
1,1,1 Trichloroethane	0.003	0.0096	0.013	0.003	1900
Benzene	0.0036	0.0034	0.007	0.0026	1
Toluene	0.0084	0.007	0.035	0.0075	375
Trichloroethene	0.00051	ND	ND	ND	270
Methylene Chloride	ND	ND	ND	0.019	105

ND- Not Detected, detection limit based on total ng
NA- Not Applicable
NIOSH = National Institute for Ocupational Safety and Health
TWA = Time weighted Average

TABLE 19

ANALYTICAL RESULTS FOR TCE IN SOIL SAMPLES
FROM AUGER-HOLES
NEC, 501 Ellis Street, Mountain View, CA

Auger Hole Number	Depth (feet)	TCE Concentration	
		Photovac (mg/kg)	Laboratory (mg/kg)
BA-14	14.0	0.096	0.017
BA-16	14.0	0.14	0.13

TABLE 20

STATISTICAL EVALUATION OF LABORATORY DATA ON TCE IN SOIL SAMPLES FROM THE STOCKPILES AND AERATION PADS
NEC, 501 Ellis Street, Mountain View, CA

Sample Location	TCE Concentration (mg/kg)	
	Mean*	Standard Deviation
Stockpile #3	0.002	0
Stockpile #4	0.002	0
Stockpile #5	0.004	0.002
Aeration Pad #1	0.002	0
Aeration Pad #2	0.003	0.002
Aeration Pad #3	0.003	0.001
Aeration Pad #4	0.002	0
Aeration Pad #5	0.004	0.002

* Mean of six samples from each source

TABLE 21

PHOTOVAC AND LABORATORY TCE RESULTS FOR SOIL SAMPLES FROM THE STOCKPILES NEC, 501 Ellis Street, Mountain View, CA

Stockpile Number	Lab Sample ID	PhotoVac (mg/kg)	Laboratory (mg/kg)
3	CSB3-1	NA	<0.005
	CSB3-2	NA	<0.005
	CSB3-3	NA	<0.005
	CSB3-4	NA	<0.005
	CSB3-5	NA	<0.005
	CSB3-6	NA	<0.005
4	CSP4-1	<0.005	<0.005
	CSP4-2	0.005	<0.005
	CSP4-3	<0.005	<0.005
	CSP4-4	<0.005	<0.005
	CSP4-5	0.003	<0.005
	CSP4-6	0.004	<0.005
5	CSP5-1	<0.005	0.007
	CSP5-2	<0.005	0.005
	CSP5-3	<0.005	<0.005
	CSP5-4	<0.005	<0.005
	CSP5-5	<0.005	0.006
	CSP5-6	<0.005	<0.005

NA = Not Analyzed

TABLE 22

PHOTOVAC AND LABORATORY TCE RESULTS FOR SOIL SAMPLES FROM THE AERATION PADS
NEC, 501 Ellis Street, Mountain View, CA

Aeration Pad Number	Lab Sample ID	PhotoVac (mg/kg)	Laboratory (mg/kg)
1	AP1-1	0.003	<0.005
	AP1-2	<0.005	<0.005
	AP1-3	0.006	<0.005
	AP1-4	0.003	<0.005
	AP1-5	<0.005	<0.005
	AP1-6	<0.005	<0.005
2	AP2-1	<0.005	<0.005
	AP2-2	0.004	<0.005
	AP2-3	<0.005	<0.005
	AP2-4	0.004	0.008
	AP2-5	0.003	<0.005
	AP2-6	<0.005	<0.005
3	AP3-1	<0.005	<0.005
	AP3-2	<0.005	<0.005
	AP3-3	0.004	<0.005
	AP3-4	0.009	0.006
	AP3-5	<0.005	<0.005
	AP3-6	0.004	<0.005
4	AP4-1	<0.005	<0.005
	AP4-2	<0.005	<0.005
	AP4-3	<0.005	<0.005
	AP4-4	0.034	<0.005
	AP4-5	<0.005	<0.005
	AP4-6	<0.005	<0.005
5	AP5-1	<0.007	<0.005
	AP5-2	<0.007	<0.005
	AP5-3	0.006	0.008
	AP5-4	<0.010	<0.005
	AP5-5	0.011	<0.005
	AP5-6	0.012	0.005

TABLE 23

LABORATORY RESULTS FOR CHEMICALS OF CONCERN IN SOIL SAMPLES FROM THE STOCKPILES
NEC, 501 Ellis Street, Mountain View, CA

StockPile No.: Sample ID: Concentration Units:	4 CSP4-1 (mg/kg)	5 CSP5-1 (mg/kg)
METHOD 8010 Analyte		
Bromodichloromethane	<0.005	<0.005
Bromoform	<0.010	<0.010
Bromomethane	<0.010	<0.010
Carbon tetrachloride	<0.005	<0.005
Chlorobenzene	<0.005	<0.005
Chloroethane	<0.010	<0.010
2-Chloroethylvinyl ether	<0.010	<0.010
Chloroform	<0.005	<0.005
Chloromethane	<0.010	<0.010
Dibromochloromethane	<0.005	<0.005
1,2-Dichlorobenzene	<0.005	<0.005
1,3-Dichlorobenzene	<0.005	<0.005
1,4-Dichlorobenzene	<0.005	<0.005
1,1-Dichloroethane	<0.005	<0.005
1,2-Dichloroethane	<0.005	<0.005
1,1-Dichloroethene	<0.005	<0.005
cis-1,2-Dichloroethene	<0.005	<0.005
trans-1,2-Dichloroethene	<0.005	<0.005
1,2-Dichloropropane	<0.005	<0.005
cis-1,3-Dichloropropene	<0.010	<0.010
trans-1,3-Dichloropropene	<0.010	<0.010
Methylene chloride	<0.020	<0.020
1,1,2,2-Tetrachloroethane	<0.005	<0.005
Tetrachloroethene	<0.005	<0.005
1,1,1-Trichloroethane	<0.005	<0.005
1,1,2-Trichloroethane	<0.005	<0.005
Trichloroethene	<0.005	0.007
Trichlorofluoromethane	<0.010	<0.010
Vinyl chloride	<0.010	<0.010
1,2,4-Trichlorobenzene	0.13	0.007
Freon 113	0.006	0.006

StockPile No.: Sample ID: Concentration Units:	4 CSP4-1 (mg/kg)	5 CSP5-1 (mg/kg)
METHOD 8020 Analyte		
Benzene	0.006	<0.005
Chlorobenzene	<0.005	<0.005
1,4-Dichlorobenzene	<0.005	<0.005
1,3-Dichlorobenzene	<0.005	<0.005
1,2-Dichlorobenzene	<0.005	<0.005
Ethyl Benzene	<0.005	<0.005
Toluene	<0.005	<0.005
Xylene	<0.005	<0.005
METHOD 8040 Analyte		
4-Chloro-3-methylphenol	<0.10	<0.50
2-Chlorophenol	<0.10	<0.50
2,4-Dichlorophenol	<0.10	<0.50
2,4-Dimethylphenol	<0.10	<0.50
2,4-Dinitrophenol	<0.50	<2.5
2-Methyl-4,6-dinitrophenol	<0.50	<2.5
2-Nitrophenol	<0.10	<0.50
4-Nitrophenol	<0.10	<0.50
Pentachlorophenol	<0.50	<2.50
Phenol	<0.10	<0.50
2,4,6-Trichlorophenol	<0.10	<0.50
METALS Analyte		
Antimony	130	8.2
Cadmium	<0.50	2.2
Lead	<5.0	<5.0
Arsenic	8.9	<2.5

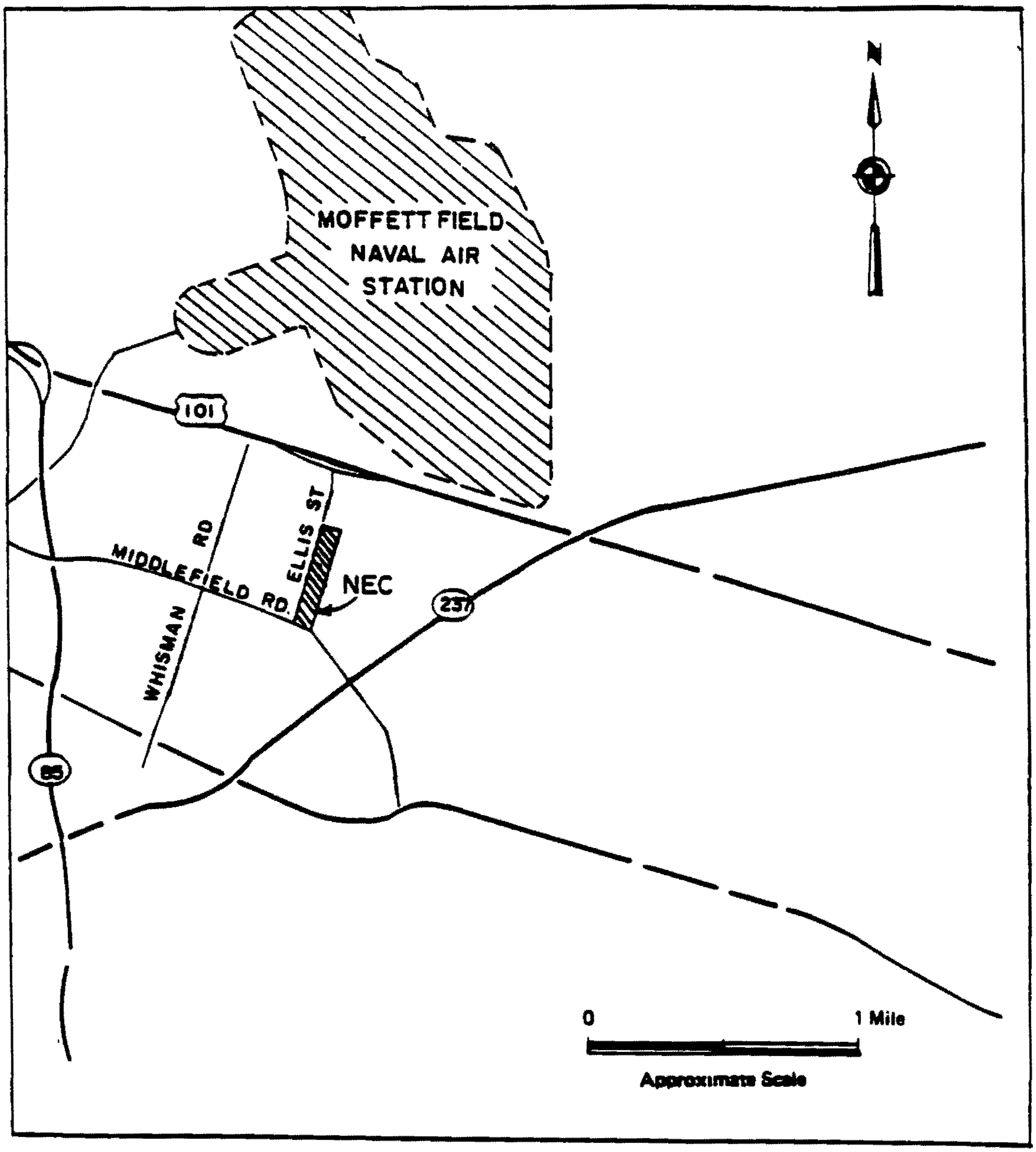
TABLE 24

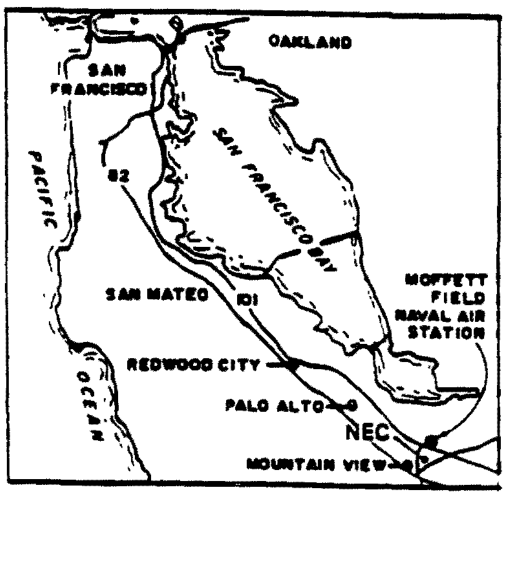
LABORATORY RESULTS FOR CHEMICALS OF CONCERN IN SOIL SAMPLES FROM THE AERATION PADS

NEC, 501 Ellis Street, Mountain View, CA

Aeration Pad No.: Sample ID: Concentration Units:	2 AP2-6 (mg/kg)	4 AP4-1 (mg/kg)
METHOD 8010 Analyte		
Bromodichloromethane	<0.005	<0.005
Bromoform	<0.010	<0.010
Bromomethane	<0.010	<0.010
Carbon tetrachloride	<0.005	<0.005
Chlorobenzene	<0.005	<0.005
Chloroethane	<0.010	<0.010
2-Chloroethylvinyl ether	<0.010	<0.010
Chloroform	<0.005	<0.005
Chloromethane	<0.010	<0.010
Dibromochloromethane	<0.005	<0.005
1,2-Dichlorobenzene	<0.005	<0.005
1,3-Dichlorobenzene	<0.005	<0.005
1,4-Dichlorobenzene	<0.005	<0.005
1,1-Dichloroethane	<0.005	<0.005
1,2-Dichloroethane	<0.005	<0.005
1,1-Dichloroethene	<0.005	<0.005
cis-1,2-Dichloroethene	<0.005	<0.005
trans-1,2-Dichloroethene	<0.005	<0.005
1,2-Dichloropropane	<0.005	<0.005
cis-1,3-Dichloropropene	<0.010	<0.010
trans-1,3-Dichloropropene	<0.010	<0.010
Methylene chloride	<0.020	<0.020
1,1,2,2-Tetrachloroethane	<0.005	<0.005
Tetrachloroethene	<0.005	<0.005
1,1,1-Trichloroethane	<0.005	<0.005
1,1,2-Trichloroethane	<0.005	<0.005
Trichloroethene	<0.005	<0.005
Trichlorofluoromethane	<0.010	<0.010
Vinyl chloride	<0.010	<0.010
1,2,4-Trichlorobenzene	0.10	0.060
Freon 113	<0.005	<0.005

Aeration Pad No.: Sample ID: Concentration Units:	2 AP2-6 (mg/kg)	4 AP4-1 (mg.kg)
METHOD 8020 Analyte		
Benzene	0.005	<0.005
Chlorobenzene	<0.005	<0.005
1,4-Dichlorobenzene	<0.005	<0.005
1,3-Dichlorobenzene	<0.005	<0.005
1,2-Dichlorobenzene	<0.005	<0.005
Ethyl Benzene	<0.005	<0.005
Toluene	<0.005	<0.005
Xylene	<0.005	<0.005
METHOD 8040 Analyte		
4-Chloro-3-methylphenol	<0.10	<0.50
2-Chlorophenol	<0.10	<0.50
2,4-Dichlorophenol	<0.10	<0.50
2,4-Dimethylphenol	<0.10	<0.50
2,4-Dinitrophenol	<0.50	<2.5
2-Methyl-4,6-dinitrophenol	<0.50	<2.5
2-Nitrophenol	<0.10	<0.50
4-Nitrophenol	<0.10	<0.50
Pentachlorophenol	<0.50	<2.5
Phenol	<0.10	<0.50
2,4,6-Trichlorophenol	<0.10	<0.50
METALS Analyte		
Antimony	97	18
Cadmium	<0.50	<0.50
Lead	<5.0	<5.0
Arsenic	<5.0	<2.5



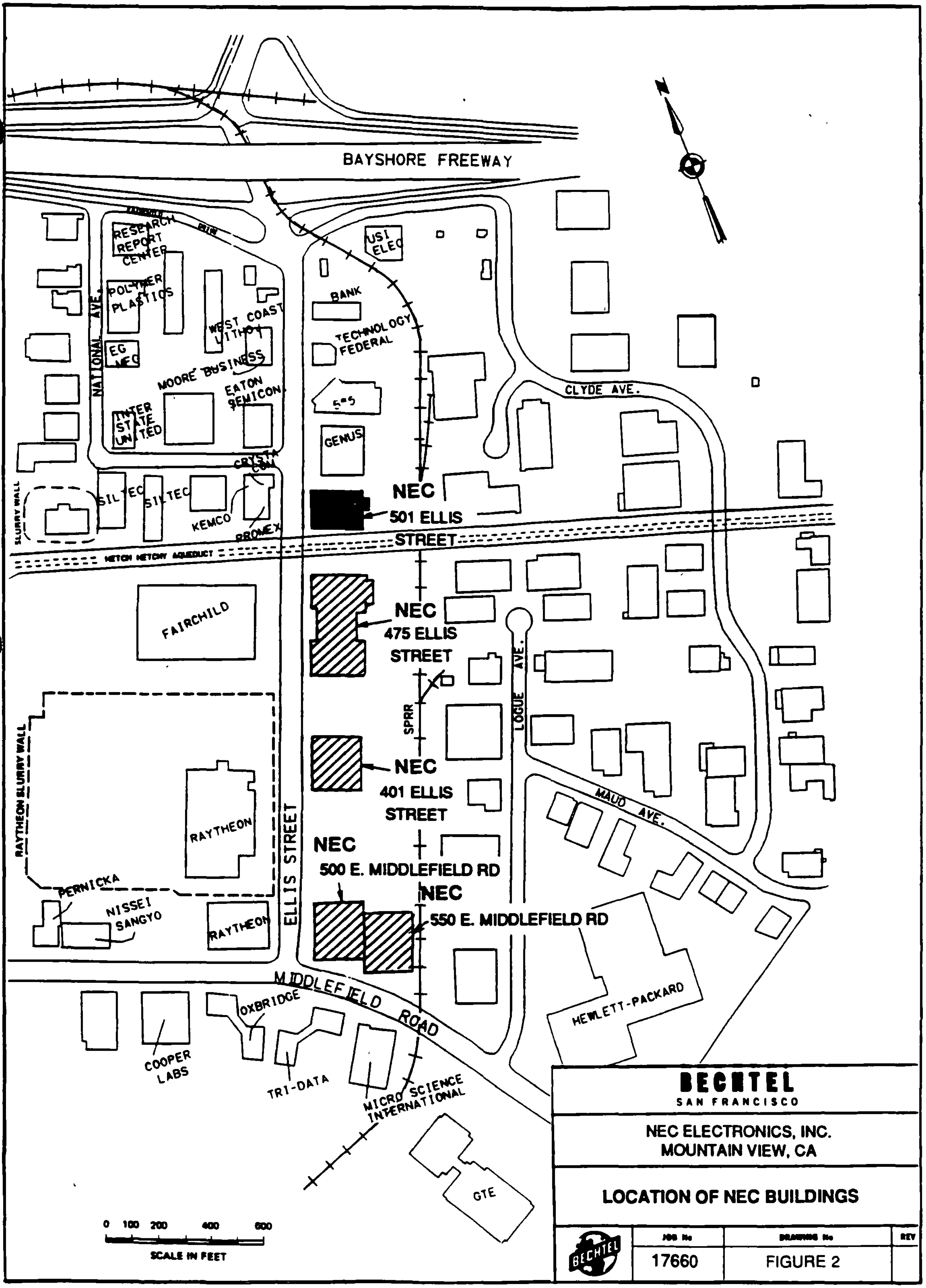


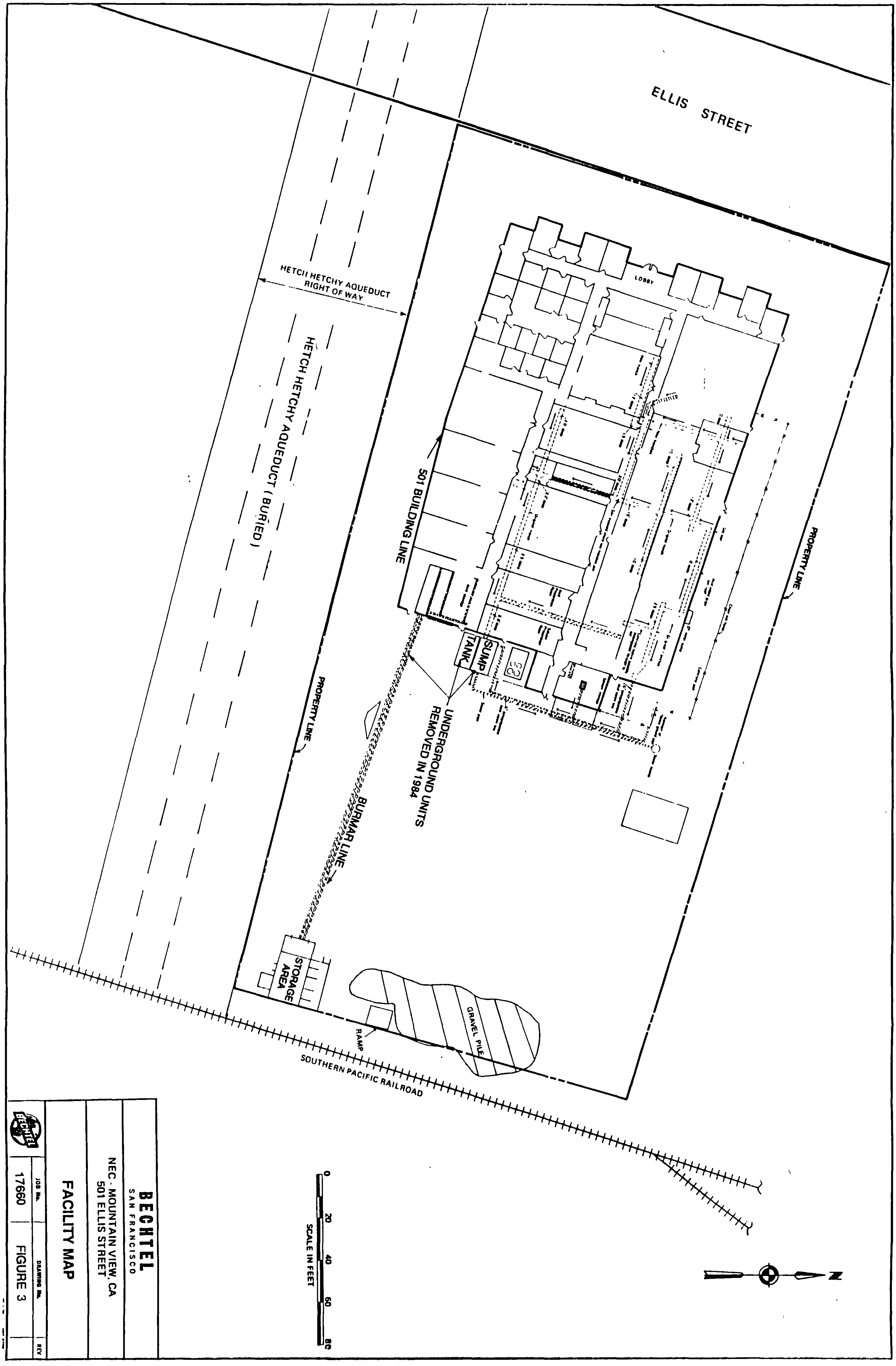
BECHTEL
SAN FRANCISCO

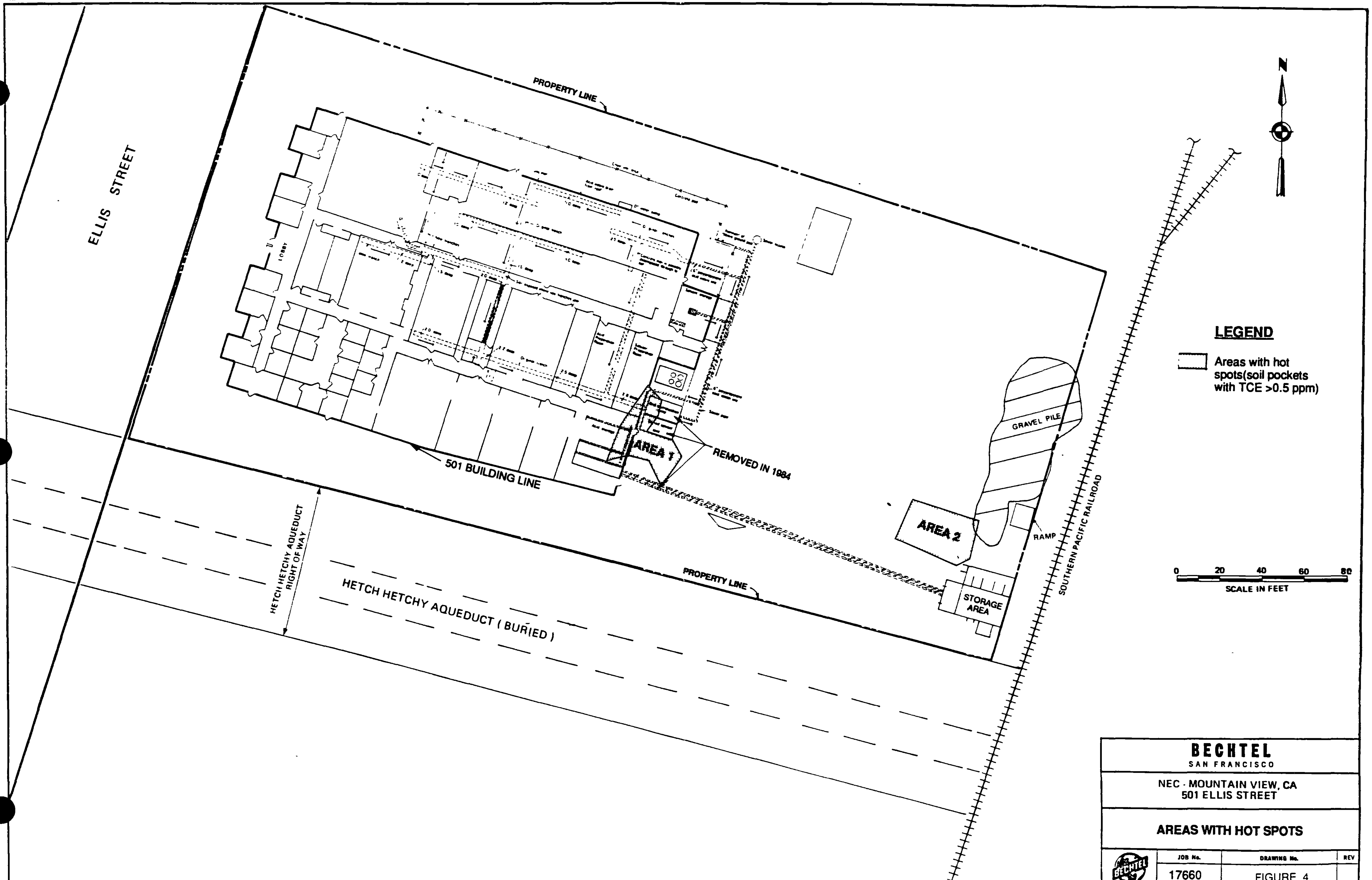
NEC ELECTRONICS, INC.
MOUNTAIN VIEW, CA

SITE LOCATION MAP

	JOB No.	DRAWING No.	REV.
BECHTEL	17660	FIGURE 1	


BAYSHORE FREEWAY
RESEARCH REPORT CENTER
POLYMER PLASTICS
NATIONAL AVE.
WEST COAST LITHO
MOORE BUSINESS
EATON SEMICON
INTER STATE UNITED
CRYSTA CON
SILTEC
SILTEC
KEMCO
PROMEX
SLURRY WALL
HETCH HETCHY AQUEDUCT
USI ELEC
BANK
TECHNOLOGY FEDERAL
GENUS
NEC
501 ELLIS
STREET
CLYDE AVE.
FAIRCHILD
NEC
475 ELLIS
STREET
SPRR
LOGUE AVE.
NEC
401 ELLIS
STREET
MAUD AVE.
RAYTHEON SLURRY WALL
RAYTHEON
ELLIS STREET
NEC
500 E. MIDDLEFIELD RD
NEC
550 E. MIDDLEFIELD RD
PERNICKA
NISSEI SANGYO
RAYTHEON
HEWLETT-PACKARD
MIDDLEFIELD ROAD
OXBRIDGE
COOPER LABS
TRI-DATA
MICRO SCIENCE INTERNATIONAL
GTE
0 100 200 400 600
SCALE IN FEET
BECHTEL
SAN FRANCISCO
NEC ELECTRONICS, INC.
MOUNTAIN VIEW, CA
LOCATION OF NEC BUILDINGS
JOB No
17660
DRAWING No
FIGURE 2
REV


ELLIS STREET
HETCH HETCHY AQUEDUCT RIGHT OF WAY
HETCH HETCHY AQUEDUCT (BURIED)
501 BUILDING LINE
LOBBY
PROPERTY LINE
PROPERTY LINE
SUMP
TANK
UNDERGROUND UNITS REMOVED IN 1984
BURMAR LINE
STORAGE AREA
RAMP
GRAVEL PILE
SOUTHERN PACIFIC RAILROAD
SCALE IN FEET
0
20
40
60
80
N
BECHTEL
SAN FRANCISCO
NEC - MOUNTAIN VIEW, CA
501 ELLIS STREET
FACILITY MAP
JOB No.
17660
DRAWING No.
FIGURE 3
REV

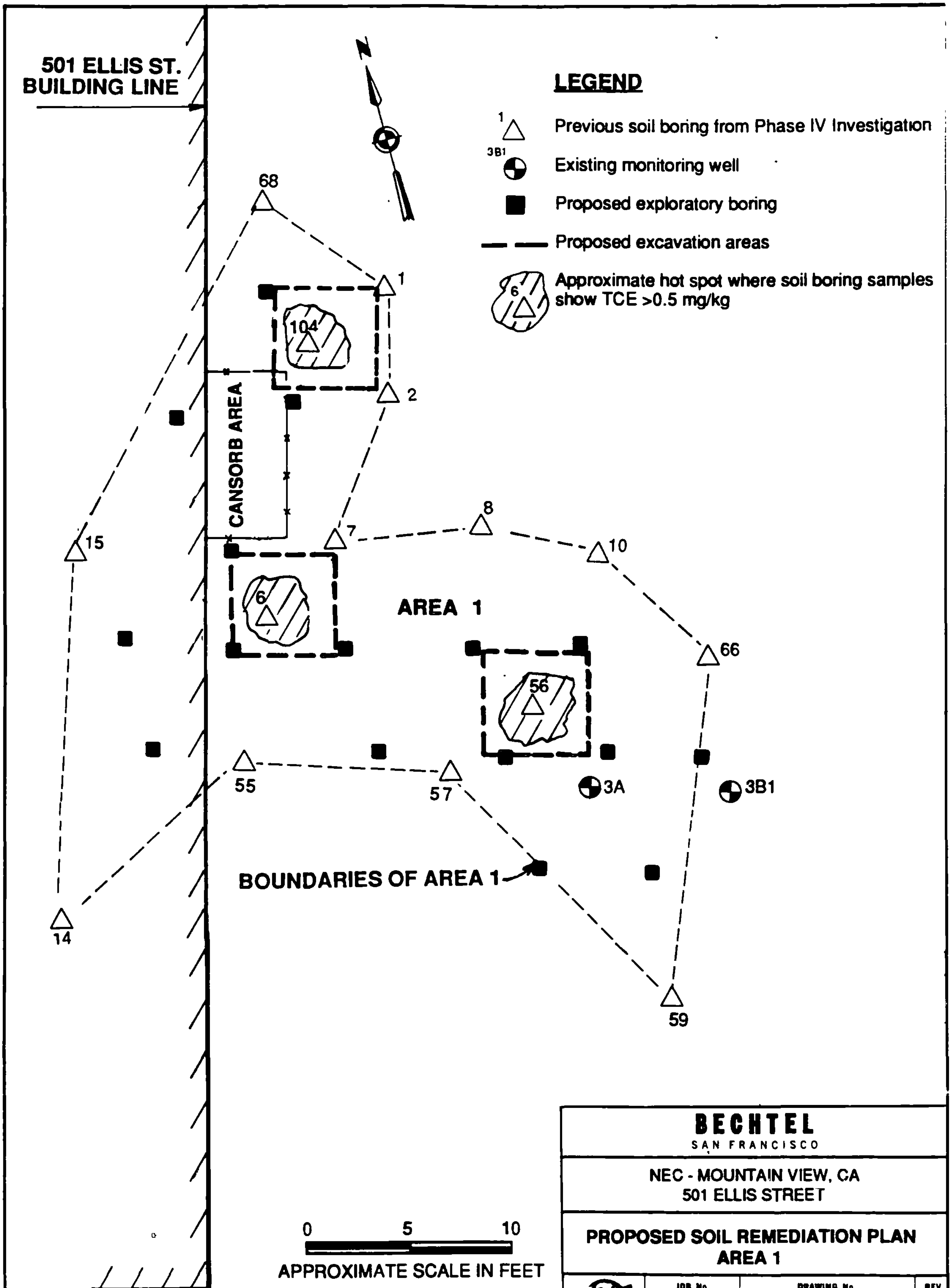


BECHTEL
SAN FRANCISCO

NEC - MOUNTAIN VIEW, CA
501 ELLIS STREET

AREAS WITH HOT SPOTS

JOB No.	DRAWING No.	REV
17660	FIGURE 4	



BECHTEL
SAN FRANCISCO

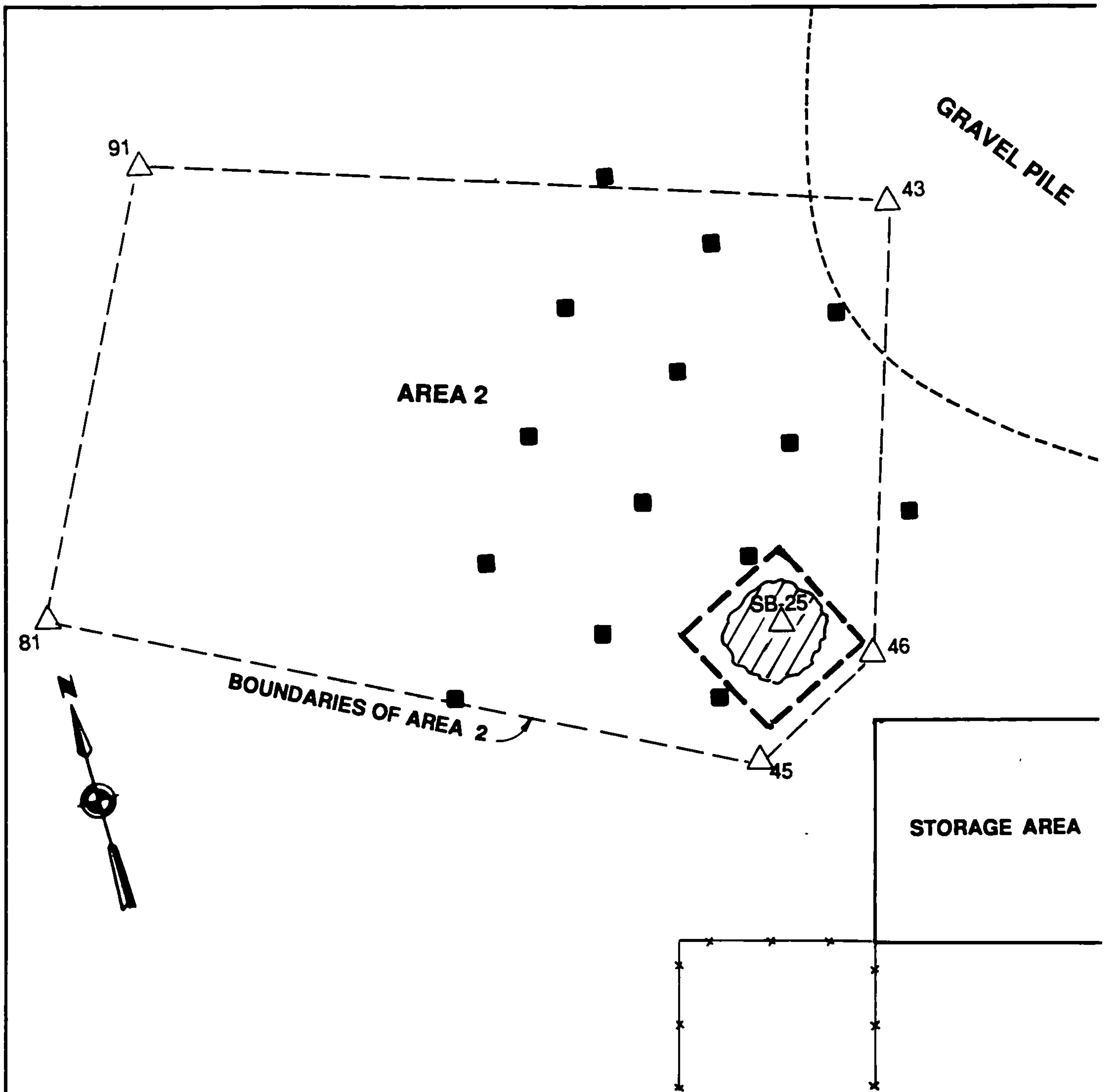
NEC - MOUNTAIN VIEW, CA
501 ELLIS STREET

PROPOSED SOIL REMEDIATION PLAN
AREA 1

JOB No.	DRAWING No	REV
17660	FIGURE 5	

143402

2



LEGEND

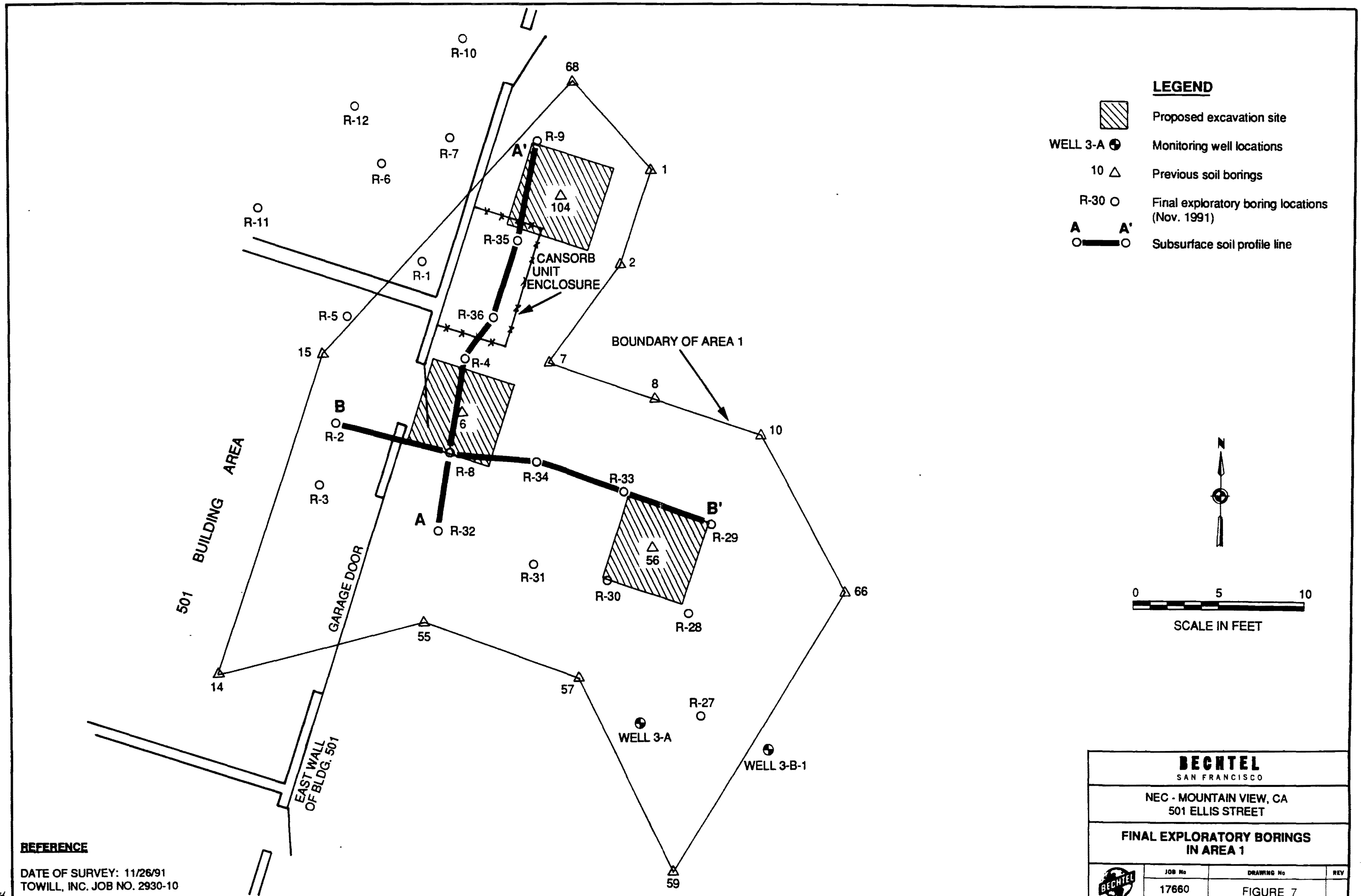
- 43 △ Previous soil borings
- ■ Proposed exploratory boring
- — — Proposed excavation areas
- Approximate hot spot where soil boring samples show TCE >0.5 mg/kg

0 5 10

APPROXIMATE SCALE IN FEET

BECHTEL SAN FRANCISCO		
NEC - MOUNTAIN VIEW, CA 501 ELLIS STREET		
PROPOSED SOIL REMEDIATION PLAN AREA 2		
JOB No	DRAWING No	REV
17660	FIGURE 6	

143402



REFERENCE

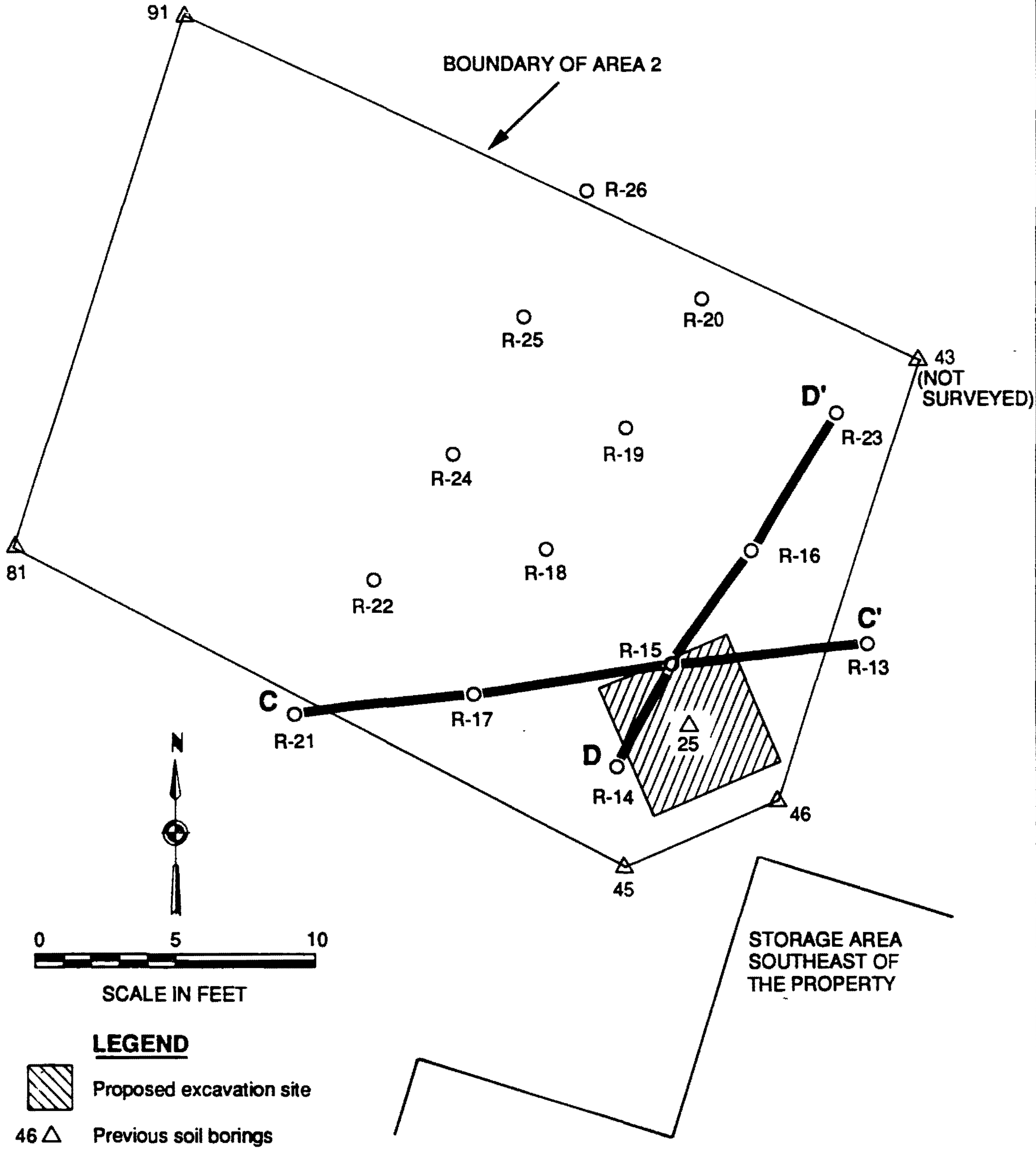
DATE OF SURVEY: 11/26/91
TOWILL, INC. JOB NO. 2930-10

BECHTEL
SAN FRANCISCO

NEC - MOUNTAIN VIEW, CA
501 ELLIS STREET

FINAL EXPLORATORY BORINGS IN AREA 1

JOB No	DRAWING No	REV
17660	FIGURE 7	



LEGEND

Proposed excavation site

46 △ Previous soil borings

R-15 ○ Final exploratory boring locations (Nov. 1991)

C C' Subsurface soil profile line

REFERENCE

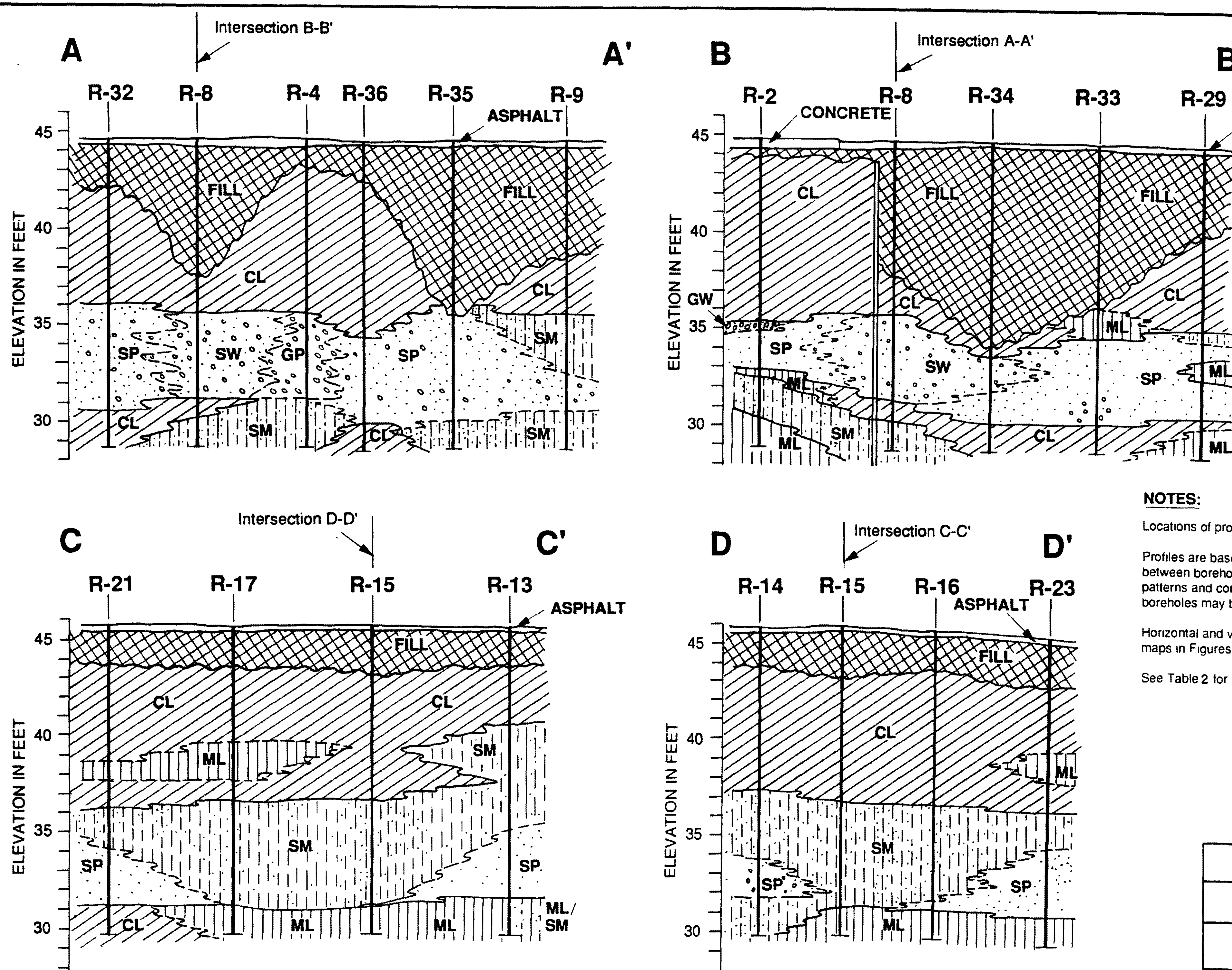
DATE OF SURVEY: 11/26/91
TOWILL, INC. JOB NO. 2930-10

BECHTEL
SAN FRANCISCO

NEC - MOUNTAIN VIEW, CA
501 ELLIS STREET

FINAL EXPLORATORY BORINGS IN AREA 2

JOB No	DRAWING No	REV
17660	FIGURE 8	



NOTES:

Locations of profile lines are shown in Figures 7 and 8.

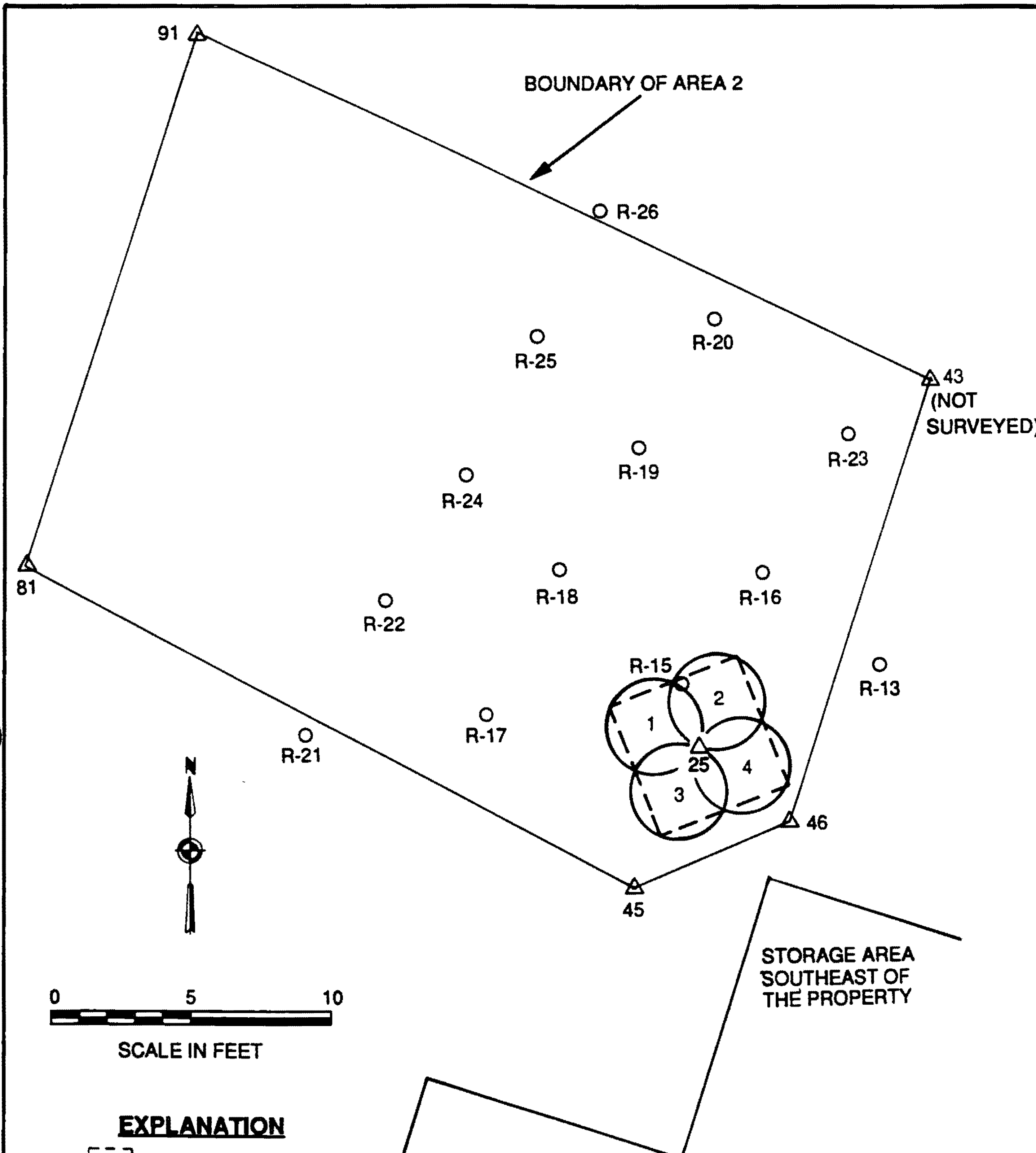
Profiles are based on borehole drill logs, are interpolated between boreholes, and are simplified to illustrate general patterns and concepts. Soil conditions between the boreholes may be different

Horizontal and vertical scales are 1 inch to 5 feet to match maps in Figures 7 and 8

See Table 2 for Unified Soil Classification System

BECHTEL SAN FRANCISCO		
NEC - MOUNTAIN VIEW, CA 501 ELLIS STREET		
SUBSURFACE SOIL PROFILES		
JOB No.	DRAWING No.	REV.
17660	FIGURE 9	

143402



EXPLANATION

Area of excavation

(2) Auger hole

46 △ Previous soil borings

R-15 ○ Final exploratory boring locations (Nov. 1991)

REFERENCE

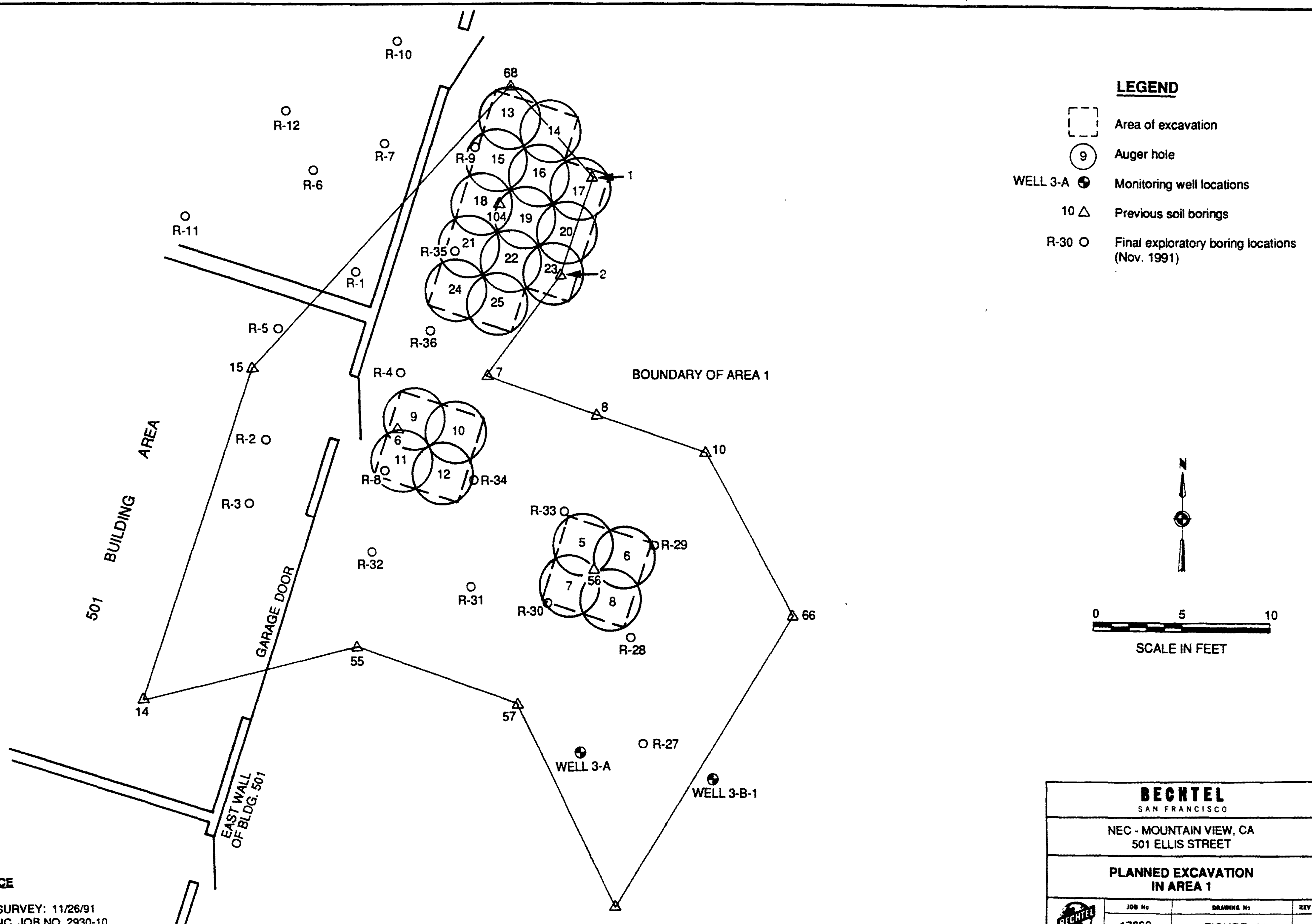
DATE OF SURVEY: 11/26/91
TOWILL, INC. JOB NO. 2930-10

BECHTEL
SAN FRANCISCO

NEC - MOUNTAIN VIEW, CA
501 ELLIS STREET

PLANNED EXCAVATION IN AREA 2

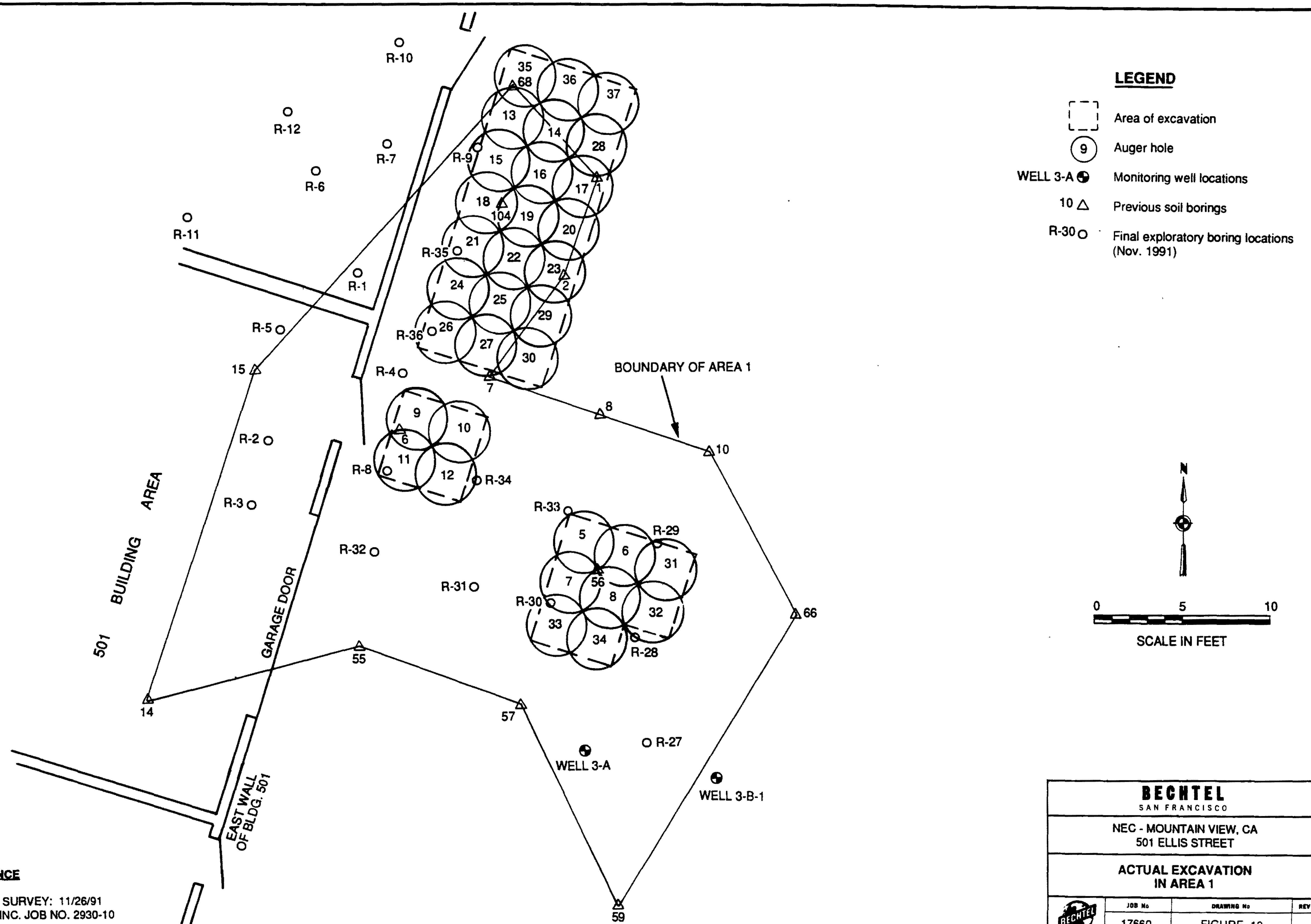
	JOB No	DRAWING No	REV
BECHTEL	17660	FIGURE 10	



REFERENCE

DATE OF SURVEY: 11/26/91
TOWILL, INC. JOB NO. 2930-10

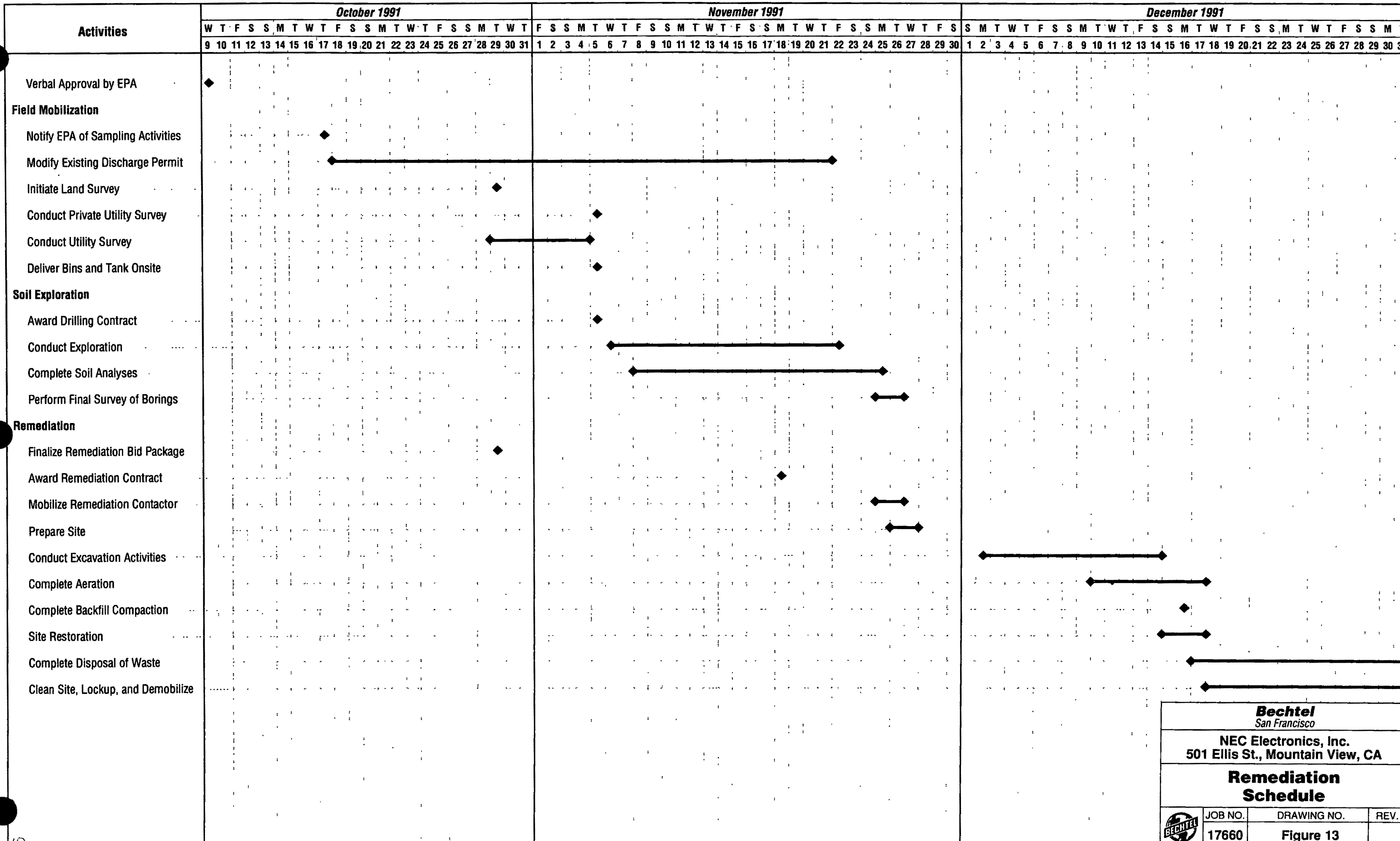
BECHTEL SAN FRANCISCO	
NEC - MOUNTAIN VIEW, CA 501 ELLIS STREET	
PLANNED EXCAVATION IN AREA 1	
JOB No 17660	DRAWING No FIGURE 11



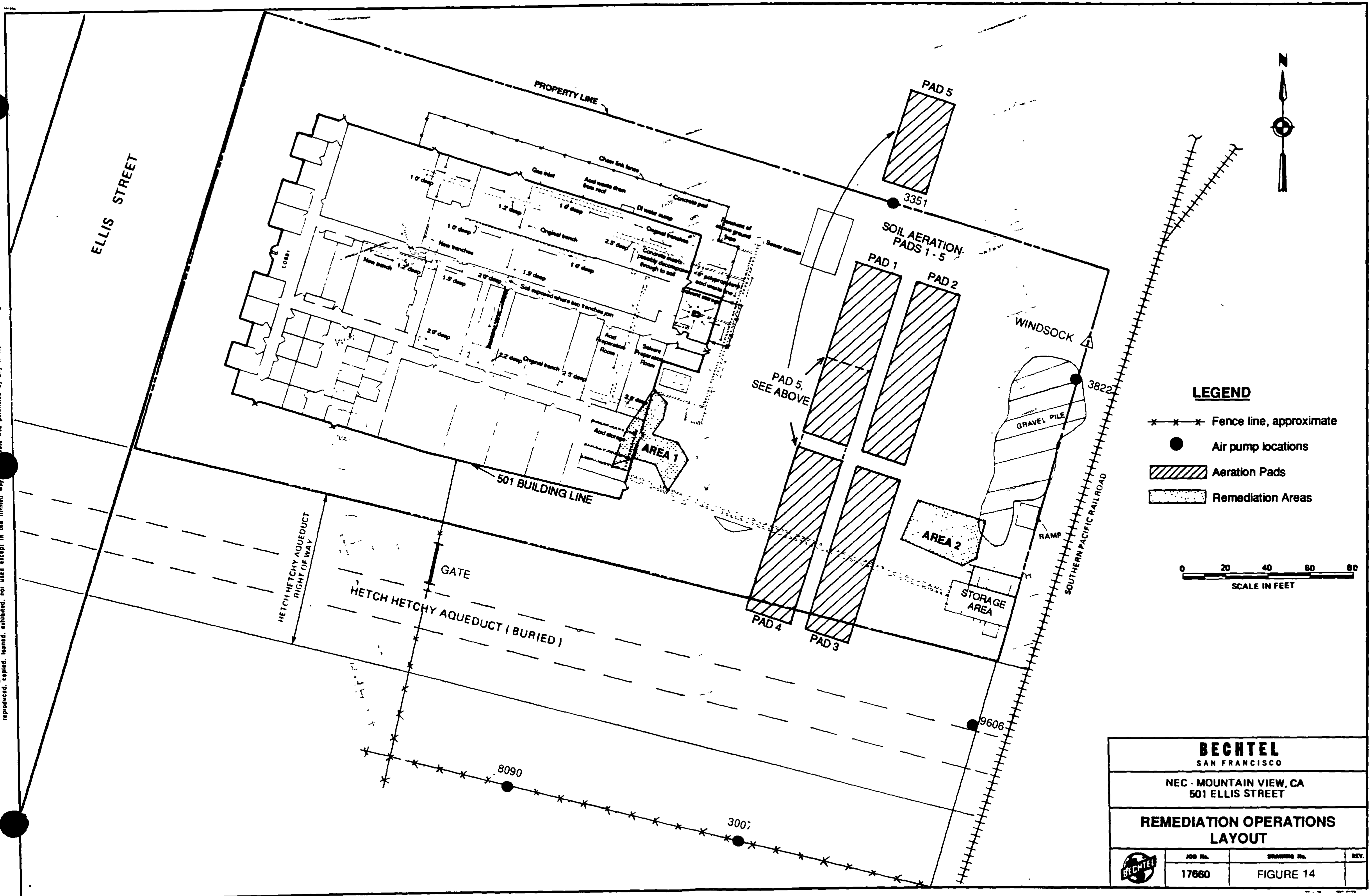
REFERENCE

DATE OF SURVEY: 11/26/91
TOWILL, INC. JOB NO. 2930-10

BECHTEL SAN FRANCISCO		
NEC - MOUNTAIN VIEW, CA 501 ELLIS STREET		
ACTUAL EXCAVATION IN AREA 1		
JOB No	DRAWING No	REV
17660	FIGURE 12	



17660/1/s/NEC/307
2-26-92 lg/vk 4



ELLIS STREET
PROPERTY LINE
501 BUILDING LINE
AREA 1
AREA 2
GATE
HETCH HETCHY AQUEDUCT RIGHT OF WAY
HETCH HETCHY AQUEDUCT (BURIED)
SOIL AERATION PADS 1 - 5
PAD 1
PAD 2
PAD 3
PAD 4
PAD 5
PAD 5, SEE ABOVE
WINDSOCK
GRAVEL PILE
RAMP
STORAGE AREA
SOUTHERN PACIFIC RAILROAD
3351
3822
9606
8090
3007
N
LEGEND
Fence line, approximate
Air pump locations
Aeration Pads
Remediation Areas
0
20
40
60
80
SCALE IN FEET
BECHTEL
SAN FRANCISCO
NEC - MOUNTAIN VIEW, CA
501 ELLIS STREET
REMEDIATION OPERATIONS
LAYOUT
17660
FIGURE 14